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- 9 FEB 1991
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Chemical Weekly

VOL. XXXVI DECEMBER 4, 1990 NO. 13

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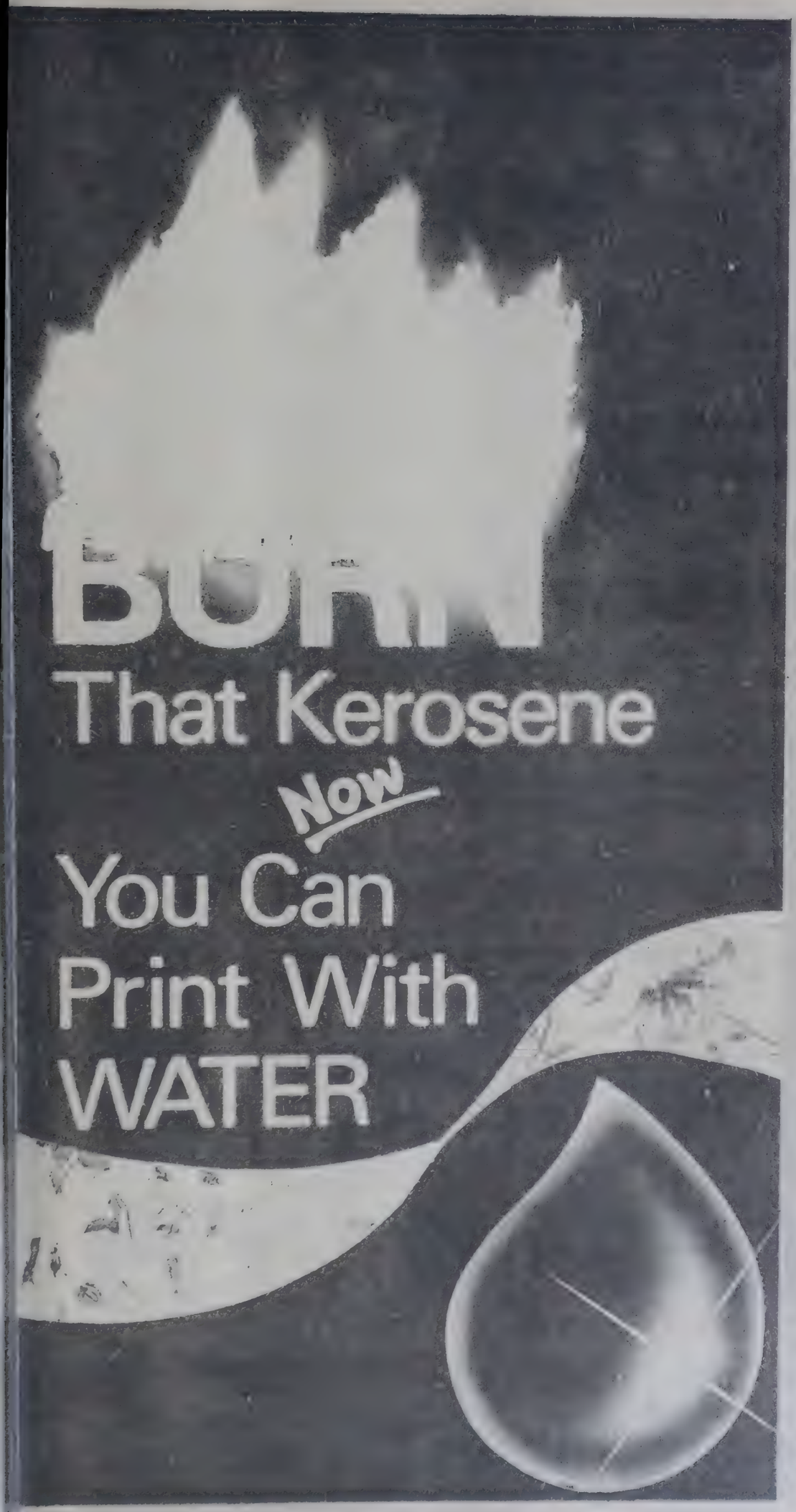

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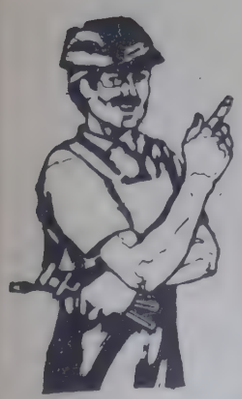

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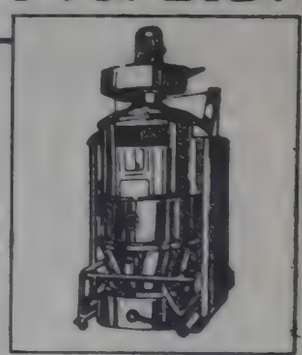

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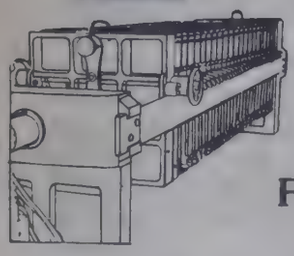

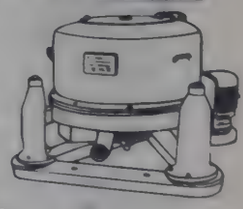

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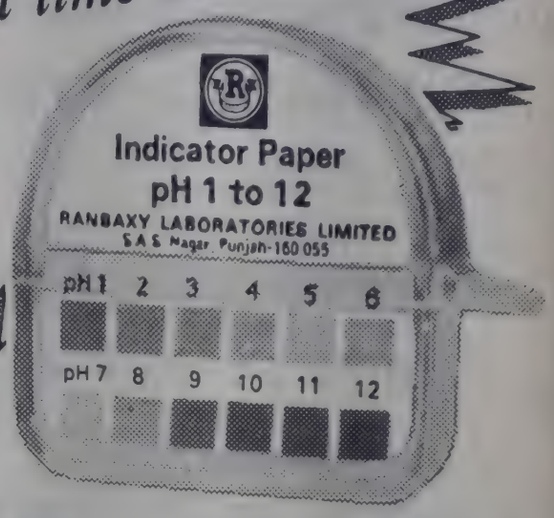

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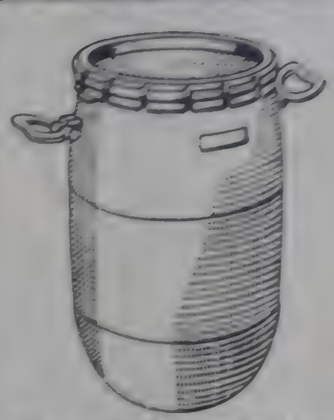

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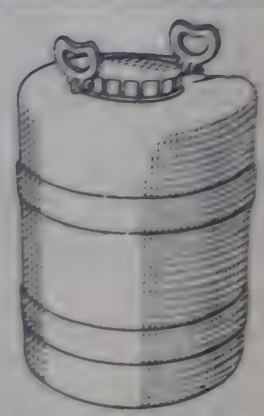

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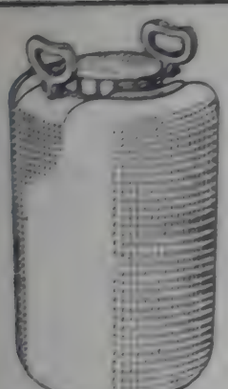

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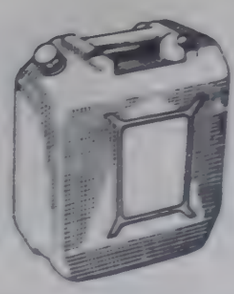

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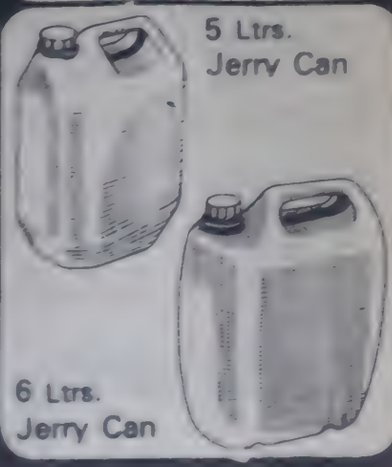

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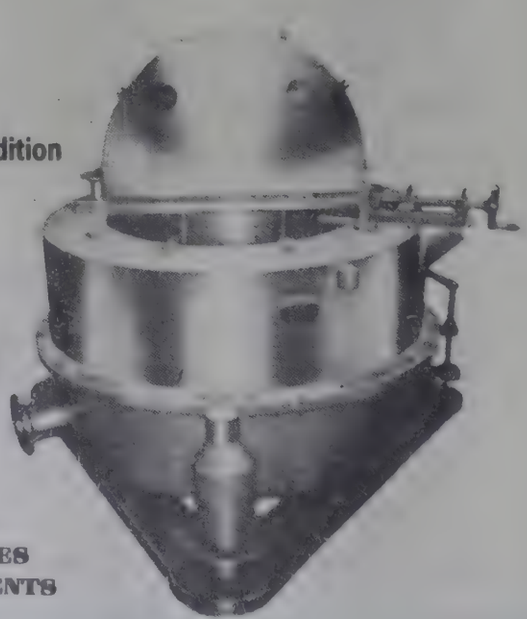

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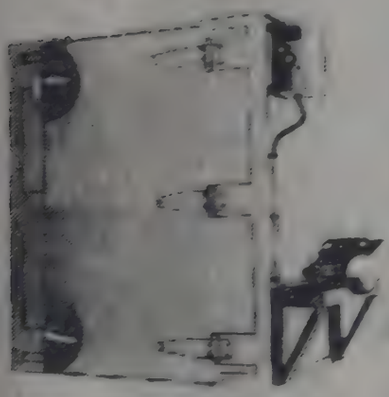

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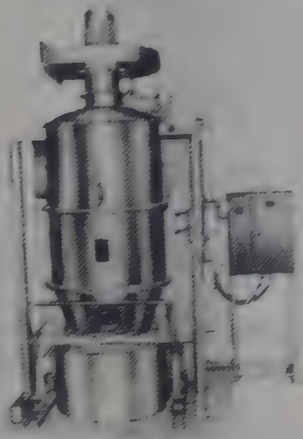

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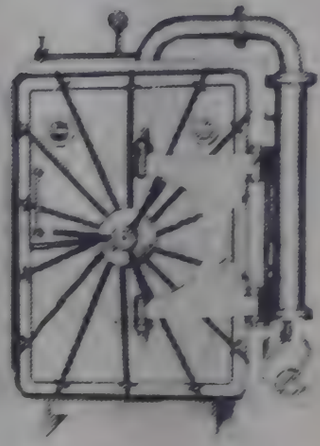

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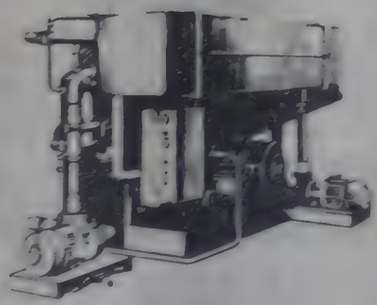

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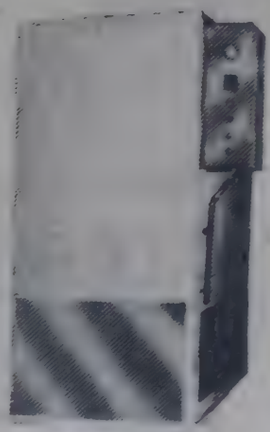

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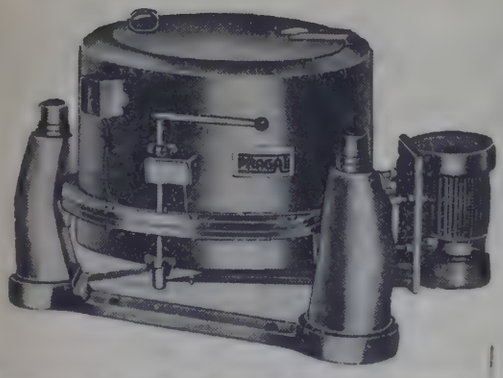

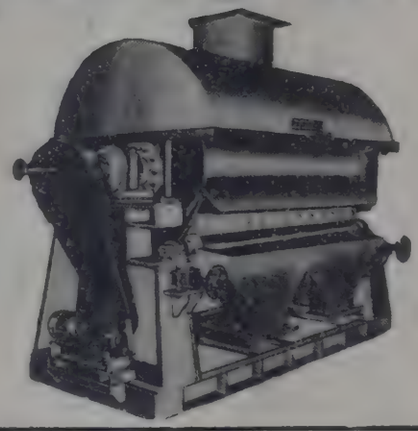

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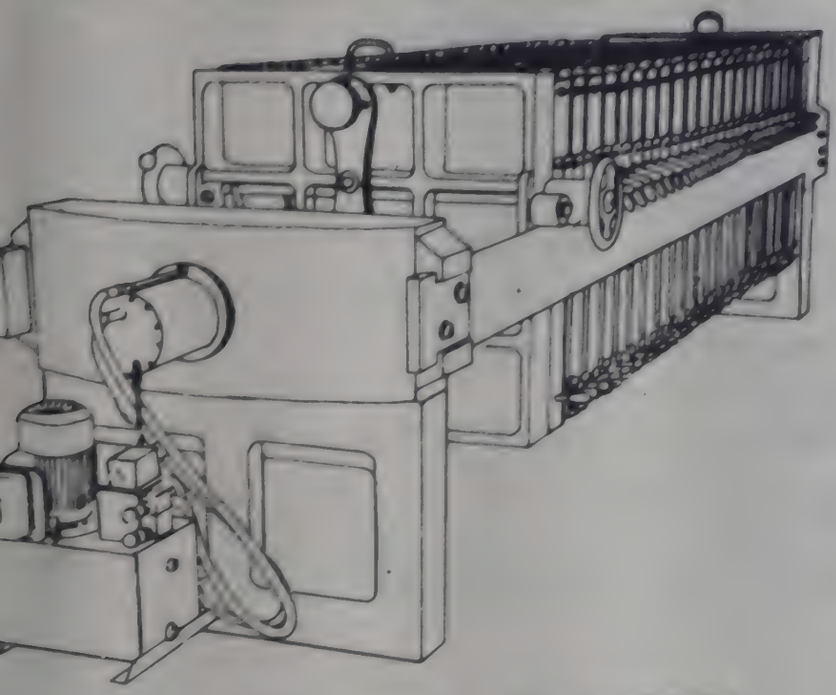

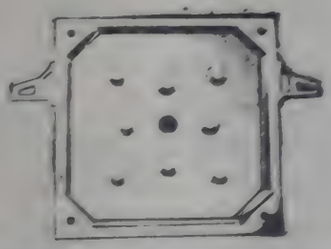

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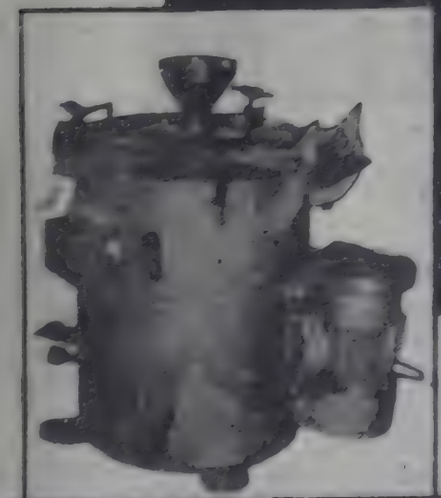

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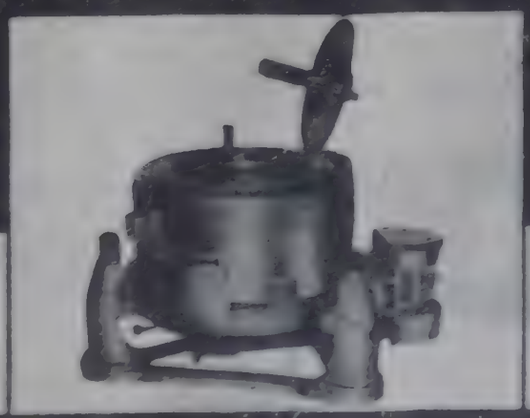

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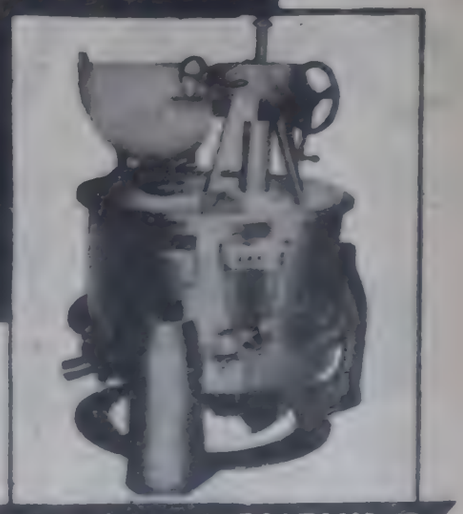

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Chemical Weekly

VOL. XXXVI DECEMBER 4, 1990 NO. 13

Publishers:
SEVAK PUBLICATIONS

Editor - Publisher
R. RAGHAVAN

Advertisement Manager
N.R. RAJAGOPALAN

Administration/Circulation
VIJAY RAGHAVAN

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306, Shri Hanuman Industrial Estate
G.D. Ambekar Road, Wadala,
BOMBAY 400 031.
Phones: 4120743/4131198.
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Madras Office:
Room No. 9, Wellingdon Estate,
3rd Floor, 24, Commander-in-Chief
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Printed at:
Sevak Publications,
25, North Mada St., Thiruvanmiyur,
Madras 600 041.

Fast Print Service,
307/308, Shri Hanuman Indl. Estate,
G.D. Ambekar Road, Wadala,
Bombay 400 031.

Annual Subscription Rates:
(Inclusive of Postage)
Inland: Rs. 400.00
Foreign: US$ 175.00 (Air Mail)
US$ 75.00 (Sea Mail)

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CHEMICAL WEEKLY

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Solar Photo Voltaics and Solar Thermal Power in the Nineties

Solar power, in its accepted working definition, is the supply of energy directly from the sun. It is essentially made up of two very distinct technologies, solar thermal and solar photovoltaics. The first technology is based on the principle of using the sun's direct heat energy and is most commonly used for supply of hot water for houses and swimming pools. Regular visitors to Mediterranean countries will have noticed this type of application in abundance, with panels often mounted on roofs to provide domestic hot water. However, it is photovoltaics which is of interest here. This is a technology where the light in the visible spectrum, from the sun is converted directly into DC electricity.

Practical application of this work had to wait until the acceleration of the space programme during the late 1980s. Solar electric power became the only viable source for orbiting satellites, despite its initial high costs, for what is the remotest of locations. Any fuel carried would have only a limited life, and the more fuel carried the larger the initial weight, in turn requiring more fuel to send the device into space. The satellite programme therefore provided the initial impetus in the use of solar electric power supplies and formed the basis of the technology used in today's terrestrial applications.

Technological advancement, notably in solar cell processing techniques, continued apace throughout the late 1970s and early 1980s. Improvements in conversion efficiencies coupled with material cost reductions made Photo Voltaics an economic proposition.

What constitutes a solar power system?

The basic component of any solar electric system is the solar cell, which, using a simple analogy, operates in a manner similar to a diode. Silicon is intensely refined to remove all the unwanted impurities. Half is then doped with boron which has excess positive electrons and half with phosphorous which has excess negative electrons. When light energy (photons) falls on the front surface of the cell, an excess of energy results in the movement of electrons between these devices exactly as in a P-N junction diode. This is then collected by a metal backplate and grid on the cell, as electricity.

The solar cells constitute a significant cost element in any solar electric power system and holds the secret of increased energy conversion. Current research encompasses other semiconductor materials as well as improvements in the existing silicon based technology.

Cells are made as thin as practicable for cost reasons. As a result of this, one avenue of investigation is in the cutting of wafers to minimise material wastage. The thinner the wafer, the less the material wasted and therefore the cheaper the cell.

To withstand the harsh environmental conditions in which they operate, cells are laminated in a manner similar to that of a car windscreen, between a layer of special high transmission glass and weatherproof plastic. To provide a unit of optimum power configuration as dictated by the electrical characteristics of the solar cells, usually 36 silicon cells are linked or 'tabbed' together to give a module typically 1 m x 0.5 m. Such a unit, typically, has an output of 50 watts at 12 V DC under industry standard test conditions.

Solar batteries

The remaining elements of a complete solar electric power system are specifically designed batteries, to store energy and thus ensure continuity of power supply and a charge control unit to create an effective and efficient battery charging regime.

To maximise output, the solar modules have to be so sited that they get the most light. This light comes from three sources: direct light from the sun, diffuse light reflected from the

atmosphere and reflected light from the earth's surface. In most instances it is direct sunlight which provides the most important element. As a generalisation, modules must be so sited that they face the equator and are tilted at an angle of tilt approximate to that of the angle of latitude. Whilst conceptually systems which track the sun have the most appeal, the mechanisms required to achieve this tend both to consume too much power, and the moving parts involved reduced reliability and increase maintenance requirements, so negating the key benefits of solar energy. Therefore, with reliability in mind most solar module support structures are designed to be of both fixed tilt and orientation with the possible small loss in module output power countered by the advantages of increased reliability.

In order to provide power during the times when the sunlight is insufficient either during the night or periods of poor weather, e.g. heavy cloud cover, a method of energy storage is required. The most efficient medium for this is the battery. Whilst it is true almost any type of battery can be used, providing the electrical parameters are suitable, solar systems have some particular design requirements. These are effectively low maintenance (i.e. infrequent battery top-up) and long life (i.e. able to withstand the heavy daily battery cycling required under these conditions). To meet such rigorous service demands, battery cells have been specially developed.

So where is photovoltaic technology currently in use?

In effect its uses are limited only by the imagination. At present however economic reality currently dictates that they predominantly exist to power telecommunications, manpack radios, provide impressed current corrosion protection, telemetry, navigational aids, water pumping and lighting. These are typified by their need for a reliable, remote power source requiring minimal maintenance. Even the UK, until recently not famous for its sunshine has found economic applications. The TV transmitting station of the BBC at Dychliemore in Scotland used a solar/wind generator hybrid system for its power supply. Many small telemetry stations for water authorities throughout the UK are now solar powered.

One such project illustrating the state of the art solar power contract has been systems for the Sierra Leone National Telecommunications Company (SLNTC).

Sierra Leone like many African countries was hit badly by the volatile fluctuations in world oil markets. One of the effects of this was to hit the important telecommunications infrastructure.

Originally the microwave network was powered by fuel inefficient closed circuit vapour turbine (CCVT) generators. However, CCVT and diesel generators need a reliable regular source fuel supply. Shortage of this fuel due to prices coupled with the inability to obtain spare parts m at times there were breakdowns in the network.

With the aid of an EEC funded contract, British Tele sult were appointed as consultant to recommend impr ment to the network. Solar power was chosen as a solu to this problem. Using the abundant 'free' sunshine cou with the use of more efficient radio equipment meant s was the obvious solution.

Solar systems are reliable, and easy to install. Maintena requirements are minimal, typically just panel cleaning an annual electrolyte top up of the batteries.

Following provision of further EEC funding, the pro was awarded to BP Solar Systems Ltd. The project invo supply of 11 systems on a full turnkey basis for SLN encompassing supply of equipment, civil works and site paration, installation and commissioning and provisio training.

Solar thermal power stations of the tower type have b shown by the European Phoebus consortium to be capa of economic and commercial viability, provided the syste suitability and location are taken into full account.

Solar thermal tower power stations with a central recei so called CRS (Central Receiver Systems) plants, have b tested on an experimental scale, for example Solar (USA), SSPS and Cesa 1 (Spain), Themis (France).

In CRS-plants, a number of movable mirror units (he stats) reflect the sun's rays onto a central unit, the recei This means that the radiation from the sun (maximum ab 1 kW/m²) is highly concentrated, so that the receiver can constructed to be relatively small and to lose very little the energy incident upon it. In the receiver, the concentra solar radiation is converted into heat on dark surfaces. T thermal energy is transferred by a suitable heat trans medium. The heat transfer medium is for example, sub quently used to heat a steam generator or a thermal stor unit. Mechanical or electrical energy is then generated i conventional steam circuit.

The GAST Federal German Technology Programme, Swiss Metaroz investigation and an American study h been concerned with further development towards la units. In the Phoebus investigation, carried out by Ger Spanish, Swedish and Swiss firms and organisations, experience of all concerned was utilised in the layout des construction and commissioning of CRS systems to prod the optimum version of a 30 MWe plant.

ie firms working on the Phoebus project have formed nsortium. The objective of this consortium is to under- all measures required for the design, construction and missioning of a 30 MWe electric power station.

ndary conditions

ze of installation — This was chosen as 30 MWe firstly s to be a sufficient size to demonstrate an industrial instal- n and secondly so that it is within the financing limits icable.

wo solar multiples (SM) were investigated, namely 1.2 2.5. The solar multiple is the ratio of the output of the iver to the input of the turbine. The higher SM is, the ater the availability and the thermal storage capacity.

The consortium partners represent experience of several tems and coolants. In order to produce a common basis, systems were first evaluated on the basis of a question- re.

The first four systems were chosen for detailed analyses phase 1A, the last two rejected.

EVALUATION OF VARIOUS PLANT SYSTEMS

olant	Power converter	Points	Ranking
t	Steam turbine	5	1
ater/steam	Steam turbine	9	2
mos. air	Steam turbine	10	3
dium	Steam turbine	16	4
m. air	Gas turbine	21	5
dium/salt	Steam turbine	23	6

Site location — The location has an important influence the design and operation of the plant. Since no site was ailable, a fictitious one was used for this purpose:

eographical location:
Barstow, California (35 North)

eteorology:
Barstow, California (35 North)

frastructure:
Almeria, Spain

It is assumed that these conditions concerning locations n be achieved or more than achieved in almost all conti- nts, with the exception of Europe.

In parallel with this, a working committee was assigned carry out a systematic evaluation of sites in 58 countries.

Layout — The optimisation calculations, carried out with a specially developed programme showed, that a circular arrangement of the heliostats is to be preferred. An arrangement with the receiver in the south of the field (north field). This applies for the air.

When the receiver is placed within the field, the number of heliostats can be reduced and consequently the area of land required. In the case of the circumferential field, the receiver has also to absorb solar radiation circumferentially.

These field layouts are based on a Spanish heliostat of 65 m^2 surface area and 3.9 mrad accuracy.

A tower height of 150 m was assumed for the installations having SM = 1.2 and a height of 200 m for those with SM = 2.5. These are, however, not optimised values.

The different receivers allow thermal loadings of different values. In the case of air, salt and water, it is therefore necessary to choose several aiming points for the heliostats in order to maintain the raadiation loading suitably low. In the case of sodium this is not necessary.

Economic performance

The costs of the solar specific components were calculated in detail from the design data. Well-known installation components were allocated market prices.

Specific heliostat costs of 510 DM/m^2 were used for the first demonstration plant having SM = 1.2. This is a conservative assumption valid for European suppliers.

The electricity costs were determined as follows.

* 9 per cent annuity, corresponding to 6.5 per cent interest, pay back 20 years
* total employees' — 40 persons in three shifts
* maintenance costs basing on investment costs: 1.5 per cent for heliostats' receiver etc., 1 per cent for turbine and 0.3 per cent for the building.

In future it can be assumed that the heliostats will be significantly cheaper. The cost situation for a future installation having SM = 2.5 is considered below. American investigations concerning the manufacturing costs of heliostats gave a value of 45 to 80 US \$/m^2, provided that a continuous quantity production of 3,000 units per year was assumed. Basing on these figures, the price of 200 DM/m^2 appears realistic.

Furthermore, it is assumed that the components can be bought in at a better quality to price relation based on exper-

ience and the activity of competitors. In addition, a ceramic storage device is to be used and the receiver, including all the associated machinery, is to be located on a suitable hill.

Conclusions

All the systems investigated are feasible, based on the experience and knowledge obtained. The sodium can probably be excluded for further investigations since it offers little advantage compared with the salt system and the risks associated with faults are greater.

The steam system is not attractive without heat storage. Depending on the location, additional firing using fossil fuels could bring significant improvements here. The other systems can also profit from additional firing, in particular the air system.

The air system appears to provide the simplest, lowest risk operation. It has also by far the smallest electricity generation costs. On the other hand, further investigations are required in order to establish a receiver of MW-size.

The extrapolation to the n-th installation indicates electricity generation costs of scarcely more than 0.2 DM/kWh. Still lower values can be attained by increasing the size of the plant into the 100 MW range.

INVESTMENT COSTS FOR A FUTURE PL
SM = 2.5 (in million DM)

Heliostat field	
Receiver	
Heat transfer system	
Steam generator	
Storage	
Steam plant	
Instrumentation, electrical equipment	
Building	
Spart parts, contingency	
Planning	
Land area	
Total plant costs	

ELECTRICITY GENERATION COSTS FOR FUTURE PLANT, SM = 2.5

Total plant costs	(10^6 DM)	27(
Annuity 9%	(10^6 DM/a)	2
Personnel	(10^3 DM/a)	
Maintenance	(10^3 DM/a)	
Costs per annum	(10^3 DM/a)	3(
Net production	(GWh/a)	13
Generation costs	(DM/kWh)	(

ELECTRICITY GENERATING COSTS FOR FIRST PLANT, SM = 1.2

		Air	Sodium	Sal
Plant costs	(10^6 DM)	280	319	290
Annuity	(10^6 DM/a)	25.2	28.7	26
Personnel	(10^6 DM/a)	2.6	2.6	2
Maintenance	(10^6 DM/a)	3.4	3.4	3.
Costs per annum	(10^6 DM/a)	31.2	34.9	32
Generation	(GWh/a)	62	52	48
Electricity costs	(DM/kWh)	0.50	0.68	0.6

— T.P.S. RA

(Source: Solar Photovoltaics for 1990s, Mark Hammonds. 30 MW Solar thermal plant — An investigation, Hams W. Fr *Energy World*, September, 1990).

CHEMARENA

L. VENKITESWARAN

MEK from butene

MEK or methyl ethyl ketone is derived from n-butene via -butyl alcohol (SBA) and subsequent dehydrogenation. It lso produced by the Wacker process (use of cuprous chlo- e catalyst generally used for acetaldehyde from ethylene) m n-butene. There is now another direct process similar the Wacker Process claimed by Catalytica Associates of lifornia, USA. This uses a complex non-chloride catalyst palladium and copper nitrates along with phosphines of vanadium, molybdenum and an acetonitrile ligand. The process claims lower investments and costs -- 30,000 TPA plant may cost $14.7 million with cost of production 26.3 cents/lb.

The process via SBA is said to result in costs of 31 c/lb by direct hydration of n-butene and 27 c/lb if hydration is via sulphuric acid. Indian production is reportedly via the sulphuric acid process to SBA.

Singapore plans for a "Chemical" Island

Singapore has several small islands off the main island and ere are two major refineries operating (based on Indone- an or other crudes). A group of six islands of 100 to 200 ctares area each are to be under a centralised authority to pand into petrochemicals in a big way. There is already e Petrochemical Corporation of Singapore in one of the lands, with a naphtha cracker of 400,000 tpa ethylene and 00,000 tpa propylene with downstream products -- polym- s, MEG, ethoxylates, MTBE, etc. Over the past several ears the investment in these islands on petroleum refineries nd chemicals is in the region of $2 billion. After integra- on of the islands under a central authority, which will pro- ide all the infrastructure, the emphasis will be on etrochemicals to make it a major centre in the Far East.

Already Du Pont has chosen one of the islands for their massive expansion into the Far East. The fibre Lycra (Span- ex) is to be produced with a capacity of perhaps 3,000 tpa nd a large investment. An adipic acid plant of large capacity is to be added and expanded to include the intermediates and polyamide 66. Mobil is examining a 300,000 tpa aromatics complex as an annexe to their refinery. Amoco, together with CAPCO has already taken steps for a paraxylene plant of large capacity to feed PTA plants in South Korea and Taiwan. CAPCO is going ahead with expansion of PTA to 1 million tonnes. Kureha of Japan is planning a large capacity of methacrylate-butadiene-styrene (MBS) resins which go for high impact polystyrene. GE Plastics is planning for large ABS capacity. Other multinationals are on the prowl.

Singapore is the largest trade centre of the Far East and production of basic chemicals will strengthen its position. The doubts are on crude oil supply and prices in the wake of the Gulf crisis. Singapore may be better placed than Japan or South Korea for exports. Specifically for paraxylene world demand is 9 million tonnes and 40% of this will be in Asia Pacific. Du Pont's plans for Singapore for Lycra fibre sounds "finis" to such a programme in India.

Adipic acid from Butadiene

Adipic acid is produced by the oxidation of cyclohexane, n turn derived from benzene. With the higher price increase or aromatics and butadienes often available at price levels ven lower than for ethylene, there is some interest in using utadiene for other chemicals. The development of carbon- lation process to carboxylic acids has made this way to dipic acid from butadiene attractive. BASF of Germany ppears to be going ahead with a plant for 60,000 tpa of adipic cid from butadiene (already available with them as co- roduct of naphtha cracking). They are reported to have succeeded in using the C_4 reaction from the cracking directly for carbonylation in the presence of methanol to get dimethyl ester of adipic acid. This ester is hydrolysed to the acid and methanol which is recycled. The other C_4 components are taken over for other chemicals. Presumably they are not carbonylated under the conditions of the reaction. Rhone Poulenc of France seems to have another route in which butadiene is acetoxylated to diacetoxy butane and then carbonylated to 3-hexane dicarboxy ester. This is hydrogenated and they saponified to give adipic acid.

Polypropylene in the Asia-Pacific

Polypropylene is probably the polymer for which the Asia/Pacific region is acutely short at present. The capacity available is about 12 million tonnes excluding Japan but demand is far higher with the result that 350,000 tonnes were imported from outside the region in 1989. China was a big importer with 458,000 tonnes in 1978-79 but falling thereafter due to restrictions. The countries within the region traded between themselves about half a million tonnes. To meet the situation massive expansion of capacity is in progress as per details in the table alongside:

(in '000 tonnes)

	1989	1995
India	63	268
Japan	1854	2257
Malaysia	0	180
S. Korea	467	1210
Taiwan	280	400
Others	478	1650
	3142	5965

Although polypropylene capacity is on, there are doubts about the supplies of polymer grade propylene and the price of propylene.

Saudi Arabia is going ahead with large capacity for propylene from propane and polypropylene therefrom. 300,000 tonnes of propylene is to be made and 180,000 tonnes used for PP based on Himont technology. The UOP process for propane dehydrogenation is likely to be tied up although the Phillips STAR process is also said to be available. The Saudi output will help to supplement Asia/Pacific demand/supply gaps if any before the efforts for regional self-sufficiency is achieved.

India's second PP may be delayed as Reliance Petrochemicals is lagging behind. Expansion of IPCL's Baroda plant has been completed and the next stage may be the propane dehydrogenation with PP 100,000 tonnes by IPCL.

Nobel Prize for Chemistry in 1990

This year's Nobel Prize for chemistry goes to Elias J. Corey of Harvard University for his outstanding contributions in the field of synthetic organic chemistry, more particularly to his remarkable innovations that have led to the syntheses of such complicated molecules as gibberellic acid and prostaglandins. He is the originator of many reagents and methods which are now routine such as the protective groups of labile groups. The Corey-Winter olefine synthesis involves reaction of intermediate cyclic thiocarbonates with the methyl phosphite to convert ricinaldiols into cis-olefins. This idea enabled his colleague, Dr. Sheehan, to synthesise penicillin.

What is remarkable is his approach of "retrosynthesis" -- starting from the product backwards through the concept of precursors and possible ways of making these. The retrosynthetic analysis begins with listing all the features of the end structure with synthetic significance. These features include chains, rings, branches, functional groups, asymettric centres, reactivity, sensitivity and stability of each group etc. Then to reduce molecular complexity and seek precursors. A computer programme LHASA has also been devised (Logic and Heuristics Applied to Synthetic Analysis) which helps to generate "trees" of precursor structures and makes it easier to choose the best way to build up from the precursors.

Prof. Corey's present interest among others, is said to be Chemzymes -- relatively small molecules to catalyse reactions to make chiral products from achiral intermediates. This is like enzymatic actions and chemzymes are designed based on prior knowledge of how they work and what optical isomer will result. Prof. Corey's selection is the most appropriate one in the field of synthetic organic chemistry as "no other chemist has developed such a comprehensive and varied assignment of methods often showing the simplicity of genius".

Bio-process for Ibuprofen

Ibuprofen is the first phenyl propionic acid derivative to set the trend of non-steroid anti-inflammatory drugs. It is marketed as the racemic mixture though only one isomer is active.

Unlike other racemic drugs the other isomer does not harm and is only an added weight. Perhaps there is no need to resolve this isomer but now a microbial enzymatic process of separation is reported by Japanese scientists. The process converts ibuprofen into the nitrile Ibuca by action of thionyl chloride and ammonia. The racemic nitrile is hydrolysed by *enzyme nitrilase* to the S(+)- Ibu directly or via amide using nitrile hydroxylase and amidase. The method may lead to other nitrile based stereoisomers being separated by enzymes even if its use for ibuprofen may not be of economic value.

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RAW MATERIAL SHORTAGE

Phosphatic units to close

All domestic import-based phosphatic units are to shut down within the next few weeks following the Minerals and Metals Trading Corporation Ltd. (MMTC) decision to float a global tender for import of diammonium phosphate (DAP) instead of phosphoric acid. Already the DAP unit of Godavari Fertilisers at Kakinada has shut down because of lack of phosphoric acid.

Reportedly MMTC has instructions from the Union government to put foreign exchange savings above that of the interests of domestic phosphatic units. The steering committee on import of fertilisers on November 19 sanctioned Rs. 100 crore worth of phosphatic fertiliser imports.

However, domestic units are expected to receive a short lease of life because of supply of phosphoric acid of around one lakh tonnes from Senegal under a joint venture agreement between India and the African country. Reportedly, it is obligatory on the part of the Indian government to buy what is offered by Senegal. The import of phosphoric acid required to run DAP units for the entire year is in the range of 16 lakh tonnes. Against this, the targeted imports are 10 lakh tonnes.

To the extent of the import of phosphoric acid, the amount of DAP imports will have to be adjusted so that the total quantum of imports fall within Rs. 100 crore sanctioned by the government.

According to rough estimates the foreign exchange savings on import of DAP instead of phosphoric acid are not expected to be very much. In fact estimates based on international prices ruling in the third week of October show that the import of phosphoric acid would be cheaper, though marginally, than importing DAP. The CF prices per tonne of importing DAP, phosphoric acid and ammonia were $228, $396 and $174 respectively (ammonia has to be imported as it is mixed with phosphoric acid to manufacture DAP). According to these prices the value of domestically made DAP with imported acid and ammonia works out to $226.62 — about $1.38 cheaper per tonne.

But in the last few weeks the relative price of phosphoric acid has gone up faster than DAP prices in the international market, making DAP imports cheaper. But sources claim that the differential may not be very high. Besides, the total quantum of savings will not be very large in the context of the fact that DAP imports will be limited because of the acid import from Senegal from within limited funds.

The squeeze on import of phosphatic fertilisers on account of lack of foreign exchange is likely to have an adverse impact on availability of phosphatic fertilisers in the country. Government sources claim that they will just about be able to manage until the beginning of the kharif season, but this will be at the expense of bringing down phosphatic fertiliser reserves to almost zero levels.

MIPAK PLASTICS TO MARKET DU PONT CONTAINERS

Du Pont has appointed Mipak Plastics Pvt. Ltd. as its packaging licencee in India to manufacture and market containers made from "Selar RB", a modified nylon barrier resin incorporating Du Pont's patented laminar technology. The decision to appoint an Indian licencee is in response to the growing market potential for laminar barrier containers to replace glass and metal containers in developing countries. Similar licencees have also been appointed in China and Thailand, according to a company release.

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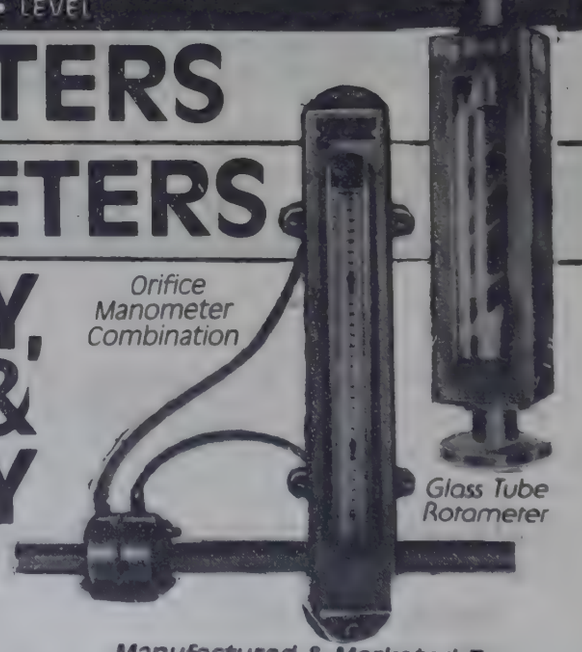

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GAS SUPPLY TO PROPOSED FERTILISER UNITS

Tatas, Chambal Fertilisers reach out-of-court accord with GAIL

In an out-of-court settlement arrived at New Delhi on Nov. 26, Tata Chemicals and and Chambal Fertilisers have agreed to sign a marginally amended contract with Gas Authority of India Limited (GAIL) for supply of gas to their proposed fertiliser projects.

Tata Chemicals has stated in a news release that it has already handed over to GAIL a signed copy of the contract in duplicate together with a cheque of Rs. 4.4 crores by way of bank guarantee, sought by GAIL as part of the gas supply contract.

GAIL has sought time up to December 3 by when it hopes to execute the contract. Chambal Fertilisers of Birlas is also expected to sign the contract, although no specific details of when it would sign the agreement is as yet known.

With this out-of-court settlement, the major stumbling block created in the smooth implementation of these two projects has been cleared.

The settlement, in fact, represents a significant climb-down by the two giants of the Indian industry in the face of tough stand taken by GAIL and the petroleum and chemicals ministry.

The problem arose when three of the several gas-based fertiliser projects planned to come up during the Seventh Plan were delayed to such an extent that GAIL found that there were no takers for its gas.

It had constructed a 1,700-kilometre long pipeline on schedule to supply gas to these projects. But since the three of them, Bindal Agro, Tata Chemicals and Chambal Fertilisers, had not yet commissioned their plants, GAIL's pipeline capacity utilisation was adversely affected. Thus GAIL devised a mechanism by which it could compensate its financial losses incurred on account of the delay in commissioning of the three fertiliser projects.

GAIL asked the three promoters to sign with it gas supply contract, under which they would have to give an undertaking for using a minimum quantity of gas by a given period of time, failing which they will have to pay compensation to GAIL. They would have to furnish a bank guarantee for this purpose.

Initially, all the three promoters lodged their protests with the petroleum and chemicals ministry against GAIL trying to impose on them what they thought an arbitrarily framed contract. But in view of the tough stand of the ministry, Mr. Abhey Oswal of Bindal Agro backed out and agreed to sign the contract.

The remaining two, Tata Chemicals and Chambal Fertilisers, insisted that the contract was one-sided, unfair and unreasonable. They also filed a writ petition before the Delhi High Court seeking a restraint order on GAIL's move to force them to sign the contract.

GAIL had threatened that if they do not sign the contract, the ministry would cancel the allocation of gas to the two projects.

The out-of-court settlement was arrived at recently before the Delhi High Court could pass its orders. A major rethinking of strategy seems to be responsible for the two companies to have suddenly given up the legal battle and agreed to the same old contract, which they were opposing tooth and nail a few months ago.

A Tata spokesman, however, said Tata Chemicals was not a company given to litigation. In filing the writ pe tion Tata Chemicals was not motiva by any narrow commercial conside tion, but by much larger considerati of public and national interests, wh involved the farmer and the exchequ

The company believed that it cou seek a fair and reasonable contract a not coerced into signing a contract t appeared unfair and unreasonable to

The spokesman further stated th Tata Chemicals was deeply and irrev ably committed to the implementati of the fertiliser project. He pointed o that at present national interest was critically at stake that the country m have to import fertilisers for a long period if the project is delayed. Th Tata Chemicals has no difficulty, af exhausting the other options, to sign t contract with GAIL for supply of g for its fertiliser project at Babrala Uttar Pradesh, because it was feared th in the absence of the gas contract, se eral vital consents and approvals for t project may get further delayed, t spokesman added.

APPOINTMENTS

Mr. M.R. Bhansali, president Cyanides & Chemicals Co. has be elevated and designated as chief exe utive (chemicals) of Hindustan Dev lopment Corporation Ltd. He will no be heading Cyanides & Chemicals C and Petrocarbon & Chemicals Co. the units of HDC.

Mr. R.K. Goel has taken over chan as general manager of Fertiliser Corp ration of India Limited, (Sindhri uni

Mr. S.P. Mandelia, senior presider Century Rayon, has been elected pre ident of the Council of Industrial Safe for the fifteenth year in succession.

Mr. Murari Lal Dalmia of Narma Synthetics, Silvassa, has been elect president of Silvassa Synthetic Ya Industries Association for 1990-199

Fertiliser scarcity to continue

elf-sufficiency in the fertiliser sector ears a distant dream with estimates cating that the nation is likely to face ortage of three million tonnes of es- ial fertilisers during 1990-91, igh new projects may marginally e the situation. While 8,543,000 nes of fertiliser was produced in the ntry last year, the consumption of h nitrogenous and phosphatic ferti- r was of the order of 11,571,000 nes. With new plants going into mmercial production in 1990-91, pro- ction of nitrogenous fertilisers is to rease to 7.1 million tonnes and that phosphatic fertilisers to 2.2 million nes, according to official sources. e sources say over 25 per cent of the al domestic requirement for fertiliser s met by imports last year.

The situation in world fertiliser rket, where India and China are the o major buyers, has not been good th the diammonium phosphate (DAP) ces going up in the wake of the Gulf sis. Self-sufficiency in fertiliser has ined urgency with the Planning mmission envisaging that nearly 80 r cent of the contemplated addition to e nation's foodgrains production uld be accounted by increased use of tilisers, as the land area would remain re or less the same.

At present, India averages about a w of 65 kg per hectare in fertiliser use, gainst China's share of 237 kg. Of this, unjab uses a maximum of 159 kg per ctare, Andhra Pradesh 131 kg and at e lowest comes Assam with seven kg. emands are being made for more s-based fertiliser projects as a large unk of the nation's natural gas, which the dominant feed stock for the fer- liser industry the world over, is being ared to no use.

The first gas-based fertiliser project the South, the Rs. 785-crore Nagar- na Fertilisers and Chemicals Ltd. at akinada in Andhra Pradesh, is nearing mpletion. Licensed to produce five lakh tonnes of urea per annum, the plant is scheduled to go on stream in August next. Production of urea — used extensively for the paddy crop — stood at 14 million tonnes and the production-demand gap in 1991-92 is expected to be about 25 lakh tonnes. In Andhra Pradesh alone, the present demand is of 16 lakh tonnes.

The company has signed a contract with Gas Authority of India Ltd. (GAIL) for uninterrupted gas supply through a 95-km pipeline from Krishna-Godavari basin, and will not have to depend on imported feedstock. According to Mr. K.V.K. Raju, Managing Director of NFCL, the project cost of Rs. 785 crores is being financed by term-loans to the order of Rs. 589 crores and equity capital of Rs. 196 crores.

The Nagarjuna group, the largest industrial house in Andhra Pradesh, has 150,000 share holders now and hopes to raise it to 493,000 when the public issue, claimed to be the largest equity share issue in the annals of the Indian stock exchange, gets underway. Nagarjuna Fertilisers and Chemicals Ltd. has been promoted by the Nagarjuna group with equity participation from the Government of Andhra Pradesh, the 'KRIBHCO' and Snam Progetti of Italy which is providing technology for urea production.

Dr. G.P. KANE TRUST LECTURE

Mr. M.S. Patwardhan, Vice-Chairman, National Organic Chemical Industries Ltd. Bombay, will deliver the current year's Dr. G.P. Kane Trust Lecture on Thursday, the 20th December 1990. The theme of his lecture is the "Industry and the Environment". The lecture is organised annually under the auspices of the Indian Chemical Manufacturers Association.

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GAIL petrochem complex awaits PIB clearance

The Rs. 1,200-crore gas-based petrochemical complex proposed to be set up in UP has been finally sent to the Public Investment Board (PIB) for final clearance. The project will be undertaken by the Gas Authority of India Ltd. (GAIL). The Department of Petrochemicals is, however, reviewing the proposals for the downstream units which will cost another Rs. 1,200 crores.

GAIL's petrochemical project is one of the nine projects which the government wants to set up. Of these about six were approved by PIB under the Congress (I) government. However, with the formation of the National Front government, the Union Cabinet decided to review all these projects. The Cabinet cleared setting up these projects subject to routine clearance. This brought back all the projects to the Ministry of Petroleum and Chemicals for clearances once again.

The ministry had earlier sent Gandhar Petrochemicals project for clearance to PAB. This project will be undertaken by the Indian Petrochemicals Corpn. Ltd. (IPCL). Before sending this project, the V.P. Singh government had cleared the MRL-SPIC joint venture petrochemical project, to be set up in Madras. However, the MRL-SPIC venture is again being reviewed by the new government headed by Mr. Chandrashekar.

GAIL, which has no experience to undertake the project of this nature, is all set to accept the challenge. The only big project GAIL has undertaken so far is the construction of HBJ pipeline for which it is registering loss because of non-lifting of gas. GAIL however is sure of meeting 50% of the total project cost. The balance money is proposed to be raised through public sector bonds and multilateral borrowings.

According to sources, GAIL is also likely to undertake the downstream unit. This however will be subject to approval of Project Investment Board (PIB) later after the clearance from the ministry. The gas cracker is to have an initial capacity of about three lakh tonnes of ethylene. GAIL is likely to opt for import of foreign technology. The Japanese, the French and the US companies have been expressing interest in sale of technology.

GAIL was granted letter of intent for the complex in preference to the other main contender, IPCL, which will now set up Gandhar Petrochemical project awaiting approval of PAB for quite sometime now. The LI was granted in the third quarter of 1989. GAIL has been active on the project for almost a year now. The gas cracker unit which forms the heart of the complex will use ethane and propane feedstock extracted from the natural gas flowing at Auriya in the HBJ pipeline.

FACT HIKES CAPROLACTAM PRICE

Fertilisers and Chemicals Travancore (FACT) in Kerala, has announced an indicative price of Rs. 60,000 per tonne (ex-works) for its caprolactam. With a 15.74 per cent excise duty and other costs especially transport, landed cost of caprolactam to a nylon filament yarn unit could well come to Rs. 65 per kg.

Nylon filament yarn units are rather upset as they did not expect FACT to opt for such a move even granting for cost escalations in the project and delays. The 50,000-tonne per annum plant will be the biggest and reduce caprolactam imports considerably. The lone manufacturer till now has been GSFC which has recently hiked prices to Rs. 46,000 per tonne (ex-works).

There is a feeling that FACT is taking umbrage against the higher landed cost of imports at Rs. 81,000 per tonne. The nylon filament yarn industry has be pleading with FACT for the last tw months to hold talks on prices.

But it has not responded positivel It could well have explained the log behind fixing the price at such high lev since it will push up nylon filament ya prices.

Reports are supplies have start from FACT with the momentu expected to pick up in the comir months though industry expects stabil sation by March.

CALL TO WITHDRAW CUSTOM NOTIFICATION

The Indian Chemical Auxiliari Manufacturers' Association has soug immediate withdrawal of the custon notification which insists importers produce invoice from the manufacture while clearing the goods consigned b shippers/agents.

In a press note issued by Mr. L.M Gandhi, President, the Association fee that this condition is highly impractic ble because the importer has no contr over the supplier and asking him to pr duce the invoice.

In most cases importers have obtain raw material from suppliers onl as manufacturers do not directly de with consumers and, therefore, it wou be impossible to comply with th requirement of this notification.

This results in delay of clearanc which will result in total dislocation production.

NEW UNIT TO MAKE SWEETENERS

A Rs. 35-crore joint sector project the U.P. State Industrial Developme Corporation and a private sector pl wood industry will come up near t UP-Delhi border for manufacture sweeteners as a substitute for sugar

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NAGOTHANE PLANT REPAIR

Unused IBRD funds may be used

The unused World Bank funds are likely to be diverted for the reconstruction of Nagothane plant of the Indian Petrochemicals Corporation Limited (IPCL) which was damaged following a blast in early November. Though the exact impact of the damage has not been worked out as the area has been sealed off, it is roughly estimated that repairs and replacements of equipment will cost atleast Rs. 50 crore.

The IPCL chairman, Mr. Hasmukh Shah, is expected to arrive at New Delhi shortly to discuss the possibility of diverting World Bank funds for the purpose with the Department of Economic Affairs (DEA). The Petroleum Minister, Mr. S.P. Malaviya is also likely to meet the Finance Minister, Mr. Yashwant Sinha on the issue.

It is pointed out that seeking of fresh World Bank loan will delay the repair works which not only affect the IPCL's annual plans but also have a catastrophic effect on other industries. In the meantime before the plant goes on stream, the country will have to depend on imports of chemicals. The plants is not expected to be commissioned before February.

According to sources, the delay in commissioning of the plant will necessitate import of $ 100 million worth of petrochemicals which otherwise would have been produced by the IPCL plant. The Nagothane plant was expected to generate Rs. 900 crore sales turnover for the full year. The six months sales would have been amounted to approximately Rs. 270 crores. This would have resulted in internal resource generation to the tune of Rs. 40.5 crores for IPCL.

On 60 per cent capacity utilisation, the following tonnages were expected for half year of production: IDPC 24,000 tonnes, IDPC/HDFC 39,000 tonnes, polypropylene 18,000 tonnes, MEG 15,000 tonnes and ethylene oxide, 1,500 tonnes. Sources point out that these chemicals will be difficult to import in face of foreign exchange crunch.

The government priority is for imports of petroleum goods and not for petrochemicals. Hence the only option is to go in for speedy repair works thorough World Bank funds. An exercise to tie-up fresh loan from the World Bank will consume more time and adversely affect production programmes of those units which were dependent on IPCL's plant for the feedstock.

The commissioning of the Nagothane Cracker assumes importance against the backdrop of current demand supply gap of about 1.5 lakh tonnes per annum in polymers. The plant was expected to bridge a substantial amount of this shortage within a year, had the explosion not occurred. The plant would have produced about 40,000 tonnes of polymers by March 1991 alone. Among those affected by the shortage would be packaging, cement packing and pharamaceutical industries.

The imports of polymer alone will cost about Rs. 88 crores, which is a very hard option for the Centre to take under the present circumstances.

The Nagothane plant which would have gone on stream by December-end was fully financed by IPCL's internal resources and borrowings.

There was no budgetary support. Following the blast, another problem IPCL facing is that of redeployment of workforce elsewhere which will otherwise remain idle till the plant goes on stream.

The authorities are thinking of organising several training programmes to keep the workforce fruitfully occupied atleast for some time.

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ETERGENT INDUSTRY

Higher costs, lower profits

Despite growing demand, the deter-ent industry is facing a serious erosion n profitability. Companies which have erformed well during the first six nonths of the financial year are worried nat the second half will undo all that vas achieved during the first half. More han the increase in the prices of inputs ike linear alkyl benzene (LAB), soda sh and utilities, producers are worried bout the high cost and poor availabi-ity of transport. Producers are unable o move material to the market as few rucks are available.

Transport costs have gone up by 35 per cent, according to a manufacturer. Truckers are taking more than twice the normal time for despatches because of disturbances in various parts of the country. The shortage and alleged blackmarketing of diesel have also added to the delay. Banks are also not functioning in some areas in UP and Bihar. The sharp increase in the LAB price by three producers alone will raise costs by five to eight per cent, according to industry sources. Price of soda ash, another major input, has gone up by Rs. 1,000 a tonne. Utilities have become costly following the increase in administered price of LDO and furnace oil. Prices of some perfumeries used by the industry have shot up in the wake of a ban on import of residual items to save foreign exchange. The industry is yet to work out the total impact of the cascading effect of price increases. A leading producer said the industry will not be able to pass on the higher costs to the consumer in view of the market resistance and intense competition. Scaling down capacity utilisation will affect economies of scale, something the organised sector of the industry cannot afford to do. "Demand has not slackened, our problem is that we are unable to reach the market". The industry is using active ingredients at an optimal level which rules out diluting the formulation as a cost control measure. No company can risk raising prices for fear of losing its market share. This will seriously affect the industry's margins. "If the disturbances continue, it will be a major disaster", producers say.

ITALY TO SUPPLY LATEST TECHNOLOGY

The Italian ambassador to India, Dr. Gabriele Manigetti, has stated that his country is committed to contributing its best and latest technological expertise to the modernisation of Indian industry.

He said Italian technology could be used to develop Indian railways, energy, telecommunications, scientific research and to support India's efforts at upgrading agriculture health services and environment.

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IPCL carbon fibre plant ready

The carbon fibre plant of Indian Petrochemicals Corporation Ltd. (IPCL) is ready for commissioning. This will mark the entry of India into manufacture of advanced high specific performance materials. IPCL has already initiated market development activities for carbon fibre in association with organisations like Defence Research and Development Laboratory, Vikram Sarabhai Space Centre, National Aeronautics Laboratories etc.

The carbon fibre facility will not only benefit the petrochemical industry, but also the aviation, defence and space programmes. The plant is designed on technology from RK Textiles Composite Fibres Ltd. of UK at a cost of Rs. 34 crores. The process consists broadly of preparation of polyacrylonitrile precursor, oxidation in electrically heated ovens, low temperature carbonisation in nitrogen atmosphere and graphitisation at 2,600 degrees centigrade. To begin with, a 12 tonne pilot plant has been set up, considering the market size in India. The plant has been mechanically completed and is now in the commissioning stage.

Carbon fibre has diverse uses in aerospace, sports goods, automotive and industrial applications. The properties that have made carbon fibre a contemporary modern material are its high strength and stiffness combined with a low specific gravity, electrical and thermal conductivity, creep and fatigue resistance, lubricity and x-ray transparency. A given weight of carbon fibre composite can be three times as tough as the same weight of steel while offering nine times its strength.

This had led to its use in airframes, airbrakes, payloads and doors in space shuttles, pods for aero engines, rocket motor casings, tanks and ailerons, golf shaft, fishing lines, radio telescope frames and the like.

TOMCO, CLOROX TIE-UP TO MAKE BLEACHES

Tatas have joined hands with Clorox International of United States, the world leader in bleach products, to promote a joint venture styled Tata Clorox (India) Ltd. Tata Oil Mills Company Ltd. (TOMCO) and its associates will own 40 per cent of the equity. Clorox will contribute 40 per cent and the balance 20 per cent will be contributed by others. The plant, to be located in Maharashtra, will have capacity to manufacture 8,000-12,000 tonnes per year of liquid bleaches and other hygiene products for institutions as well as households. Abroad bleaches have a large institutional market comprising hospitals, canteens, hotels and laboratories.

Clorox also has household products to supplement conventional household detergents.

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ALLING Rs. 126-CRORE METHANOL PROJECT

Tripura CM blames VP government

Whether it follows a political tussle bureaucratic indecision it is hard to : but the Rs. 126-crore methanol pro-t, which is expected to bring about economic turn-about in Tripura, has led to take off even though its foun-ion stone was laid in December last ar.

The chief minister, Mr. Sudhir anjan Majumdar, squarely blames the rmer V.P. Singh government for not earing it at the instigation of his ally PI(M), now the opposition in the once ftist state. Mr. Majumdar's Con-ess(I) government has the feeling that hile the CPI(M) has been crying arse over the Rajiv government's laying tactics with Haldia Petrochem-als project in West Bengal, it has been aying the delaying trick here once they ere out of power and had established direct link with Mr. V.P. Singh.

Mr. Nripen Chakraborty, former hief minister, strongly denies any such legation of interference of the CPI(M) not allowing the project to come rough in Tripura. In fact, Mr. Chak-borty said, the project was conceived y the previous Marxist government in he state. It is difficult, to make the resent chief minister believe that the roject was held up for reasons other han political. Mr. Majumdar believes hat the last eleven months of Mr. V.P. ingh's regime had been particularly ad for Tripura because the CPI(M), he aid, had stopped almost all economic rogrammes for the state by its direct inks with the Centre. Mr. M.S. Guru-adaswamy, former Union Minister for hemicals, during his visit to Tripura, ad assured to take up the methanol pro-ect but quickly forgot once he was back n Delhi.

Mr. Majumdar expects that the new Chandra Shekhar government would hange the situation and would clear the ital methanol project for the state. Mr. Majumdar will leave for Delhi shortly to lobby for the project.

The bureaucracy of the state, how-ever, is reluctant to comment on the political aspects of the project. Senior officers are in fact surprised by the strange ways of the bureaucracy itself in Delhi for not being able to take a quick decision on the cost of natural gas of Tripura which was the real stumbling block before the project. The project has been conceived as a joint sector venture with the participation of ONGC, Tripura Industrial Development Corporation (TIDC) and the Rashtriya Chemicals and Fertilizer Corporation (RCF), Bombay.

The Union fertiliser ministry and the Union petroleum ministry, instead of sorting out the problem of the rate of purchase of natural gas at Delhi itself, were using TIDC as a go between. The natural gas struck by ONGC at Tripura was expected to change the industrial scenario of Tripura, till now a no indus-try state. But whether the gas price should be Rs. 1,000 a cubic metre or Rs. 500 a cubic metre as in Assam has been a bone of contention between the Tripura government and the Centre for long.

Since the percentage of methane in the gas found in Tripura is as high as 98 per cent, a project to produce meth-anol, an important starting point for syn-thetic resins, moulding materials and fertilizers was an ideal choice. But the quarrel over the rate of purchase of the gas, not only stalled the methanol pro-ject, but it was virtually denying Tri-pura of making any use of its huge natural gas reserves. Recently, the Kelkar Committee set up by the Bureau of Industrial Cost and Prices (BICP) has suggested that the Tripura gas should be sold at Rs. 600 per cubic metre.

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Lubrizol plant to produce isobutene

Lubrizol India Ltd. (LIL) is setting up a Rs. 10-crore project to produce pure isobutene by cracking methyl tertiary butyl ether (MTBE). Pure isobutene, which is used in speciality additives by the petroleum industry, is now totally imported from the United States. This will be the first plant to produce this material outside Europe and the United States, according to the company. LIL has also taken up projects to manufacture poly alpha olefins-based synthetic lubricants and extreme pressure additives at Taloja. Plants for producing highbase phenate and magnesium sulphonate are in the advanced stages of construction.

LIL has already commissioned a plant for manufacturing viscocity index improver and pour point depressants, which would enable the oil industry to promote multigrade engine oil. An engine oil dispersant unit has been expanded to enable manufacture of high molecular weight dispersants. The estimated capital expenditure during 1990-95 will be about Rs. 80 crores, out of which almost Rs. 8 crores will be in research and development, Mr. P.K. Rudra, LIL chairman and managing director said.

"Our mission for the next few years will be to develop chemical additives that will reduce consumption of fuels and lubricants and make industrial products environmentally safe and friendly", he said. During the last 10 years, sales turnover has increased from Rs. 28 crore to more than Rs. 186 crores. Net profit during the year amounted to Rs. 8.01 crores compared to Rs. 7.69 crores during the previous year. The company issued bonus shares in the ratio of 1:1 in May 1989. This has increased the subscribed capital to Rs. 9.60 crores. The company paid a dividend to its shareholders at the rate of 16.5 per cent on the increased equity base. LIL is a public sector company, with 40 per cent of its equity owned by Lubrizol Corporation of the United States.

NIRAJ PETRO TO SET UP MALEIC ANHYDRIDE UNIT

Niraj Petrochemicals Ltd. promoted by Mr. G. Siva Prasad Reddy of Hyderabad, is setting up a Rs. 25.75 crore project to manufacture 6,000 tpa of maleic anhydride at Vishakhapatnam in Andhra Pradesh. The promoters, Siva Prasad Reddy and associates, are a well-known business family of Andhra Pradesh with experience in industry, building construction and trade.

The project is being set up in technical collaboration with Lurgi GmbH of Germany, using the latest process developed by Chemische Werke Huls of Germany, which is being licenced to a third party for the first time. The detailed engineering is carried out by Humphreys and Glasgow. The process can take both benzene and n-butane as feedstock. A benzene recovery and recycling plant will increase efficiency in raw material utilisation to 94 per cent as against 81 to 88 per cent in other technologies, it is claimed. The plant is being located at Wadichipurupalli in Vizag district, nine kms from the Vizag Steel Plant, which will supply benzene. The Vizag port is 15 kms. away and will facilitate export of maleic anhydride. Metallgesellschaft AG of Germany, the parent company of Lurgi GmbH, will buy back 3,500 tpa of the output for five years. The demand-supply gap for this chemical in India is estimated around 9,655 tonnes. Niraj is an existing company manufacturing precipitated and activated calcium carbonate. The company proposes to enter the captial market in January 1991.

BLUE BLEND'S NEW PLANT INAUGURATED

The second plant of Blue Blends Petrochemicals Ltd. was inaugurated in Vapi by Mr. V.A. Chaschinof Syntheschim V/O Sojuzchimexport of Moscow recently. Other senior Soviet trade cals were also present on the occa

A protocol was signed on the sion between the company and the sian buyers on long-term supply o intermediates. This would involv offtake of almost 50 per cent o plant's output at 95 per cent cap utilisation.

Mr. Anand Arya, company chair said that the company is poise improve its performance substanti on the Indian and export fronts. company's plant at Ankleshwa already engaged in the manufactur H. Acid, gamma Acid, reactive dyes dye intermediates.

There are also being exported to U and UK. The Vapi plant will prod beta naphthol, bon acid and other in mediates. There is a growing ex market for dyestuffs abroad. Exports slated to increase from the cur Rs. 1,530 crores to Rs. 2,500 crore 1995. Exports have been growing at rate of 25 per cent a year. Exp during the five months of this year estimated at Rs. 185 crores, repres ing an increase of 40 per cent than t of the correponding period last yea

OIL PRICES TO DROP TO $20 BARREL — SAUDI

In what is clearly an upbeat news the global economies reeling under t impact of the escalating oil prices kingdom of Saudi Arabia predicted t crude oil prices are likely to drop almost 40 per cent to touch $20 to a barrel. In a statement issued recen the senior Vice-President of the sta owned Saudi Oil Company, "Aramc Mr. Abdallah Al Ghanim, said that ev if the Gulf crisis were to continue t price of oil will fall in the internation market. The senior Saudi official p dicted that with increasing Saudi output the Gulf oil exporting natio could meet world demand "even if t

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Alpha Drugs to make antibiotic intermediates

Alpha Drugs India Limited has set up a Rs. 30 crore facility for manufacturing critical drug intermediates for antibiotics and anti-bacterial drugs, for the first time in the country. The project to be located in Punjab would manufacture D phenyl glycine chloride hydrochoride (DPGCH), D parahydroxy Dane's salt and trimethoxy benzaldehyde. These intermediates are currently imported for entire manufacturing requirements of antibiotic and anti-bacterial drugs like ampicillin, cephalexin, amoxycillin and trimethoprim.

Mr. Anil Kohli, Executive Director of Alpha Drugs, said the company had tied up with Chementenco SRI of Italy for DPGCH for Dane's salt manufacturing technology. It had collaborated with Fuso Chemical Company of Japan for the trimeothoxy benzaldehyde technology. Alpha Drugs itself has been jointly promoted by the Punjab State Industrial Development Corporation (PSIDC) and Mr. V.K. Garg. The company as such had the status of a 100 per cent import substitutive industry, Mr. Kohli claimed.

The plant is proposed to have an installed capacity of 240 tonnes per annum of DPGCH and 60 tonnes of Dane's salt. Additionally, it can manufacture 200 tonnes per annum of trimeothoxy benzaldehyde, Mr. Kohli said. Against this manufacturing capcity, India's import requirements were huge, he claimed.

The company's manufacturing activity would save foreign exchange of nearly Rs. 80 crores per annum, Mr. Kohli said. He said that the plant was being set up according to FDA standards and is proposed to be offered for FDA approval, to give its products a seal of international quality.

Mr. Kohli said that the company adopted an unconventional route to ting up the plant by first testing technology at a pilot plant, erected the site of the main facility.

This had given the company opportunity to assess the quality of materials available in the coun besides proving the technology, he s

The company plans to enter the c ital market to raise funds for the proj It plans to offer equity shares wo about Rs. 5.5 crores for subscription public out of a total equity capital Rs. 11.3 crores.

The shares would be offered for c at par, Mr. Kohli said. Out of the equity of Rs. one crore would be s scribed by various mutual funds, I said.

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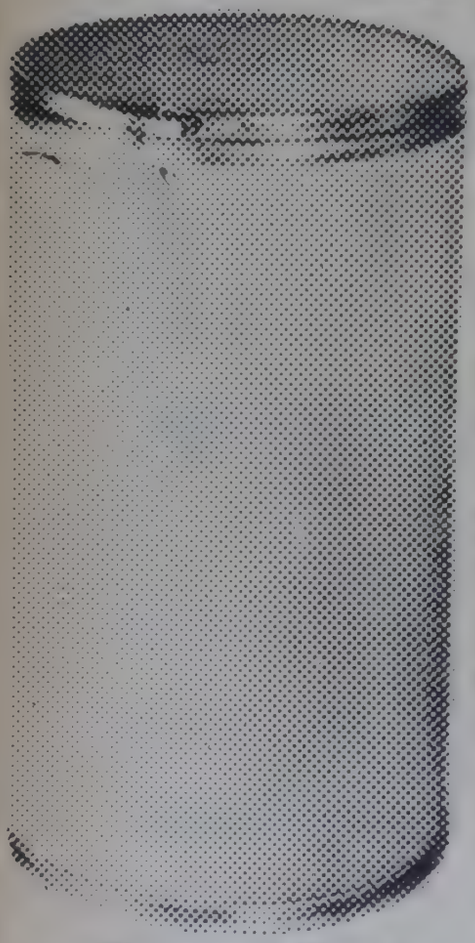

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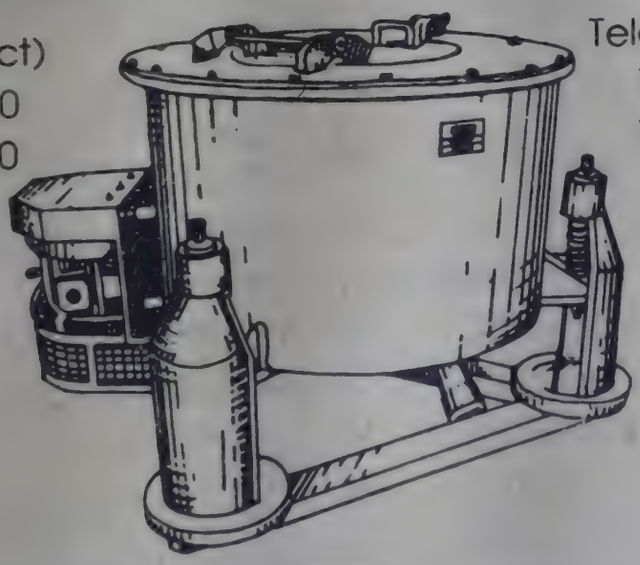

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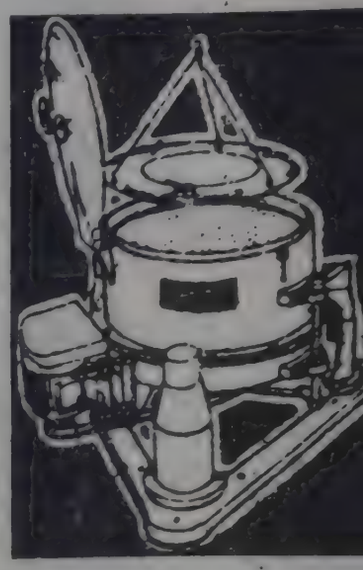

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AI SEMINAR ON "STRATEGIC ACTION PLAN FOR DYESTUFF INDUSTRY"

yestuff industry confident of achieving export target

he dyestuff industry in the country onfident of achieving an export turn- r of Rs. 2,500 crores in the next five rs provided the right inputs, partic- ly raw materials at international es, are made available to the indus- This was the opinion of most mem- s of the industry who gathered in mbay on November 16, under the gis of the Dyestuff Manufacturers sociation of India (DMAI), for a e-day seminar titled "Strategic Action an for the Dyestuff Industry".

Attended by a veritable who's-who of industry, the seminar discussed tion plans under four main heads: chnology upgradation, cost/economy production, ecology/safety, and obal marketing. Crisp, and well ought out presentations on actions to taken by government and industry to hieve a commendable target of $1 bil- on in exports by 1995-96, formed the rust of the seminar.

The seminar was attended by more an 250 delegates. Shri M.S. Gill, Sec- tary, Department of Chemicals and etrochemicals, Ministry of Petroleum nd Chemicals, Government of India, as the chief guest for the function. ther invitees from the ministry include hri R.S. Mathur, Jt. Secretary and Shri 1.S. Murthy, Adviser to the Depart- ent of Chemicals and Petrochemicals.

VELCOME ADDRESS

hri Anil Mehta. President, DMAI

Welcoming the delegates to the sem- ar, Shri Anil Mehta, President, Dyes- ffs Manufacturers Association of India cknowledged the impetus provided by e Government in arranging this sem- ar. He was particulaly grateful to Mr. 1.S. Gill, who saw a great potential in e industry. "We are glad that officials om the Department of Chemicals and Petrochemicals could be with us throughout the day," said Mr. Mehta.

Mr. Mehta felt that the industry was going through a difficult phase with the Gulf crisis having restricted availability of raw materials and increased prices; few of the small industries had even closed down.

Historical Perspective

Tracing the growth of the industry, Mr. Mehta, noted that the dyestuff industry in the country was largely a post-independence phenomena, although one unit (Arlabs Industries) had set up a unit as far back as 1939.

The industry received a boost in the 70's with the setting up of the public-sector, Hindustan Organic Chemicals Ltd., and favourable excise structure introduced in the late 70's saw a rapid growth of the small scale industries, particularly in the Gujarat and Maharashtra region, which today forms the backbone of the industry.

The 80's saw the industry enter the export markets, with the industry consolidating itself to the present position of around Rs. 530 crores in exports.

Changing world-wide scenario

Highlighting the changing scenario in world-wide production of dyes, intermediates and pigments, Shri Mehta pointed out that, whereas in 1989, the traditional manufacturers viz. Europe, U.K., America, and Japan accounted for around 63% of the global production of dyes and pigments, their shares were declining, and by 1995 were expected to drop to around 50% of global production. The slack would have to be picked up, and countries such as India, China, Korea, Taiwan and Thailand were expected to step up production to account for increasing shares of world markets.

Indian Scenario

Highlighting the local scenario, Shri Mehta, noted that the domestic market in the country was also growing rapidly, with the size expected to rise from the current levels of around 40,000 mt to 50,000 mt by 94/95 and 60,000 mt by 2000 AD. With the fortunes of the industry tied with the Indian textile industry, the domestic share of production should also be promising, opined Mr. Mehta.

He added that the industry had good resources in the form of a well developed petrochemical industry providing the necessary feedstocks and good skills in chemical engineering. While these points worked in the favour of the industry, there were indeed some lacunae which needed to be addressed, if the country were to play a bigger role in world markets. These include:

a) lack of technical sophistication,
b) inadequate R & D,
c) stagnant product mix,
d) high prices of feedstocks,
e) low scales of economics with around 950 units accounting for a production of 40,000 mt.,
f) indifferent quality,
g) lack of brand names in international markets,
h) lack of international marketing, and
i) poor consideration for aspects of ecology and safety.

If adequate steps were not taken to tackle the above weaknesses, competition from emerging countries like China, Korea, Taiwan, Thailand and even E. Europe could take market shares away from Indian exporters. Changing

buying standards also posed a threat and Mr. Mehta, urged Indian exporters to remain competitive by adapting rapidly to trends in consumption patterns in the principal markets particularly in the advanced countries.

Given the right kind of support from the Government, Mr. Mehta was confident that India could attain the targets fixed by the DMAI task-force. These are as under:

TARGETS 1995/96

DOMESTIC

	Production '000 MT	Value Rs. Cr.
Dyes + Pigments	50	1,200
Intermediates	-	500
Total	-	*1,700*

EXPORTS

	Qty. '000 mt	Value Rs. Cr.	Value* $ mill.
Dyes + Pigments	50	450	1125
Intermediates	-	550	1375
Total	-	*1000*	*2500*

* 1$ = Rs. 25.00

The task-force which was set up about a year ago had representatives from the small scale manufacturers, the organised sectors and the export houses, permitting a wide range of opinions and ideas to be made available.

It was the opinion of this task-force that the targets put forward were indeed achievable, given the right support from the Government and the correct response from industry, Mr. Mehta said.

In concluding his welcome address, Mr. Mehta, thanked the mambers of the various committees and the task force for their efforts in putting forward the recommendations.

INAUGURAL ADDRESS
M.S, Gill, Secretary, Ministry of Petroleum & Chemicals

In his inaugural address to the audience Shri M.S. Gill stressed his deep commitment to this industry and said that he was extremely glad to find an impressive gathering of the entire industry, which he felt was a measure of the interest that the industry had towards the vital export effort.

"I had been suggesting the holding of such a seminar and I am happy that it has been possible to organise it today. The seminar has been structured in a business-like manner and I am sure that this arrangement would be conducive to useful deliberations leading to a concrete action plan", said Mr. Gill.

"I have felt a deep commitment to this segment and recognize the great potential you have for expansion of indigenous markets, exports with service to self and to country.

"In a short presentation of slides, your president has given an excellent review of the industry", Mr. Gill said. Stressing the vital backward and forward linkages of the industry, Mr. Gill noted that his department dealt with most of the backward linkages and even some of the forward linkages.

"Petrochemicals, inorganic chemicals and some organic chemicals constitute the upstream industry for the dyestuff industry and textiles, plastics, paints, pharmaceuticals, the fine chemical industries as also the printing ink industry, are the downstream products. The industry therefore plays a very crucial role in the economy of the country", he said.

Space available for growth

Addressing the export prospects, Shri Gill noted that there was considerable space available for a growing Indian dyestuff industry, particularly because a number of western coun decided to give up this messy for others. "This is a natural development and cannot be ig the early parts of the twentieth the growth and building of indu largely in these countries, bu longer so", he said.

While many countries wer away from manufacture of d world still needed all these ch "We are at a stage of deve where we must take up the production), because if we do n will", said Mr. Gill. "The spa able for a growing Indian in also available to others", h Urging the industry to step up e earn vital foreign exchange, that "in our and even the next tion I do not see a stage where not worry about exports. With o ing population we will always problem of balancing our ne resources."

On his part, Mr. Gill j remarked that "we are the ch hold you down and the best w is not to do so. This in itself i itive target". More seriously h that the Government must cr conditions which should not hi industry. The next five years, felt, were vital for the country. personally to the chemical an maceutical industry to give a exports," he said. Drawing a c son with the pharmaceutical i which had succeeded in pen markets in many of the develope tries like USA, Germany and S land, Mr. Gill hoped that the industry would meet with grea cesses in such markets.

Commenting on the Gulf cri Gill said that the situation s affects us although it is not making. "Industry is concerned b of the rising costs", he said. Not our consumption of petroleum p was meagre, he felt that econom

troleum products has a limit. "Our s of use is not anything to speak nd major uses are in such traditional ors such as the requirement of diesel ransport and agriculture. The thrust lleviate the balance of payments blems must be on exports", he said.

vironmental problems

triking a note of caution, Mr. Gill ed the industry to recognise that the blems with pollution were very ser-s. While lack of resources was a jor constraint, the laws were in place, l public sensitivity had become reasingly tuned to this problem. hile a large number of small scale ustries gave dispersed benefits, with arge number of entrepreneurs, the lustry is more prone to the problem pollution", he said. Financial limits nder it difficult to permit adequate puts to solve the problem, but the oblem needed urgent attention. "Are u going to ignore the problem or wait l someone points it out?" Mr. Gill ked. He suggested the possibility of me collective effort in pollution con-ol, but urged industry to come up with me concrete plans rapidly as the law nd the people will not permit any laxity r long.

ver-dependence on textiles

An analysis of the industry's fortunes, Ir. Gill felt, clearly revealed an over-ependence of the industry's fortunes to hose of the textile industry. World-vide the trend has been to move away rom this traditional area, and greater rowth has recently been seen in out-ets such as paints, plastics as compared o textiles.

Even in textiles, synthetics are xpected to overtake natural fibres, par-icularly in a country like India, where he need to clothe a teeming population dequately and cheaply will necessarily nean greater share of synthetics. "While nterest in rubber, jute, cotton must be rotected, greater growth will come rom synthetics. Cotton, which is more expensive, can be increasingly diverted into exports", Mr. Gill said.

Mr. Gill also urged the industry to take up energy conservation, and improve energy efficiency. This was a long term need and requirement he felt.

Commitment to R & D essential

Urging the industry to commit to R&D, Mr. Gill noted that laws concerning intellectual property rights are changing globally. "We cannot be borrowers of technology for long", he said.

Concluding his address, Mr. Gill said that the issues being raised at the seminar will be taken note of. "You have a crucial role in solving our problems, by improving production, reducing pollution, improving R&D and above all increasing exports", he urged.

While Mr. Gill's address to the audience was largely extenpore, a text of his adress was made available to the press. Owing to the important nature of the seminar, and the role the government could play in the development of the industry, we reproduce below the text of the address by Mr. Gill.

TEXT OF ADDRESS BY SHRI M.S. GILL

"I am glad to be here today, to inaugurate this seminar on the dyes and dyestuffs industry, I had been suggesting the holding of such a seminar for some time now, and I am happy that it has been possible to organise it today. I find that the seminar has been structured in a business like manner, and I am sure that this arrangement, would be conducive to useful deliberations leading to a concrete action points.

I would like to spend as much time as possible with you today, but due to exigencies of work, I may not be here all day. Nevertheless, officers of my Ministry, would be present throughout the deliberations, to take note of the points being made. I am glad to see that officers of Departments other than mine, are present, and I am sure their presence would lend weight to the recommendations.

The dyestuff industry, as you all know, has very imortant backward and forward linkages. As it happens, my Ministry deals with most of the backward linkages, and some of the forward linkages also. Petrochemicals, the inorganic chemicals, and some organic chemicals industry, constitute the upstream industry for the dyes and dyestuff industry, and textiles, plastics, paints, pharmaceuticals, the fine chemical industries, as also the printing ink industry are the down-stream products. The dyestuffs and dye industry, therefore, plays a very crucial role in the economy of the country. But dependent as it is, on petroleum-based products for its manufacture, and textile related industry for its survival, its status at a particular point of time, is closely linked with the fortunes of these two industries. We all know that the textile industry has been facing a crisis for the last few years. Added to this, is the recent crisis which has been imposed upon us, for reasons beyond our control, with possible shortage and, certainly, increased cost of petroleum based products. The dyestuff and dyes industry is, therefore, passing through critical times.

The production of the industry has had a chequered record from 1980 onwards. While the years 1980 to 1984 saw a net decrease of 9% in the production of different types of dyes, the years 1985-87 saw a net increase of 3.2%. The variations in the decrease or increase of different groups of dyestuffs were also very wide. For instance, during the period 1980-84, the disperse dyes recorded an increase of 66% of production, while the basic dyes recorded a steep decrease of 94.6%.

In the period 1985-87, oil and spirit soluble dyes recorded an increase of 93.1%, solubilised vat dyes recorded an increase of 188.5%, and disperse dyes continued to record an increase of 33%.

Out of these, however, the solubilised vat dyes, and the basic dyes constituted a very small proportion of the total production of dyes, and the only consistent trend that can be noticed, is an increase in the productiion of disperse dyes, which went upto 19077 tonnes in 1980. However, from 1980 to 1987 there was a net decrease in the production of dyes, which came down to 19077 tonnes as compared to 20244 tonnes. These figures relate to production in the organised sector, and if the production figures of the small scale sector are added, the total production comes to around 29,000 tonnes in 1987. The industry has been beset with problems of poor capacity utilisation, which is only of the order of 51% in organised sector, and 47% in the small scale sector for the year 1987. The declining trend in production is directly attributable to the fate of the textile industry, which suffered from a decline in the demand for cotton cloth.

The sectoral distribution of dyestuff industry shows that there are 48 units in the organised sector, and as many as 900 units in the small scale sector, with a total employment of around 40,000 persons. In geographical terms, the entire industry is located in the western part of the country, which is perhaps due to historical reasons, since the bulk of the textile industry was also located in this region. Even though the performance of the dyestuff industry was poor from 1979 onwards, it had been doing well till that time. The reasons for the decline in the performance of the industry, cannot be attributed to absence of capacity or lack of technology, since India produces almost all types of dyestuff groups including disperse dyes, basic dyes, vat dyes, organic pigments, reactive dyes, etc. but it was due to fall in demand of the user industry. However, a recent study which had been undertaken by my Ministry, through a special group on dyestuff and intermedites, has shown a more encouraging picture for the industry in the coming years. While the demand for the year 1989-90 has been projected at 40,065 tonnes, is expected to increase to 49,980 tonn in 1994-95 and around 61,000 tonnes the year 2000, thus giving an avera compound growth rate of 4%. This below the projections made for t chemical industry as a whole, as we as of the other sectors of the chemic industry, but is reasonable considerin the recent negative growth. The stud has painted this optimistic scenario, o expectations of higher disposabl income available with the people, an the growth of consumerism, but eve here, the growth rate projections var for different types of dyes, being th lowest of around 1.5% for azo and direc dyes, and around 10% for acrylic fibr dyes and disperse dyes. Recent trend have shown, an increased consumptio for synthetics and blends at the expens of cotton, and by the year 2000, a pat tern of 60% cotton and 40% blende and synthetic fibres is expected to stab ilise. The industry should, therefore reorient its production pattern to thes kinds of requirements. This is also i keeping with trends the world over where the ratio of cotton to non-cottor is likely to settle at the above leve Obviously there should, therefore, b more emphasis on dyes which are usec for synthetics and blends, rather tha those which are used for cotton, whic would mean that we would be requir ing more disperse dyes. These types o dyes, therefore, hold the promise of th highest potential for development.

Mr. M.S. Gill, Secretary, Ministry of Chemicals and Petrochemicals, inaugurating the seminar on 'Strategic Action Plan for the Dyestuffs Industry" organised by the Dyestuffs Manufacturers Association of India (DMAI) in Bombay. To his right are Mr. P.R. Rastogi, organising secretary of the seminar, and Mr. Anil Mehta, President, DMAI.

Apart from textiles and textile related uses, I think the dyes and dyestuf industry, should also try to focus on the other sectors of use of dyes, and reorient its production. An over-dependence on the textile industry may not be in the overall interest of your industry. The worldwide consumption trends show, that the growth for non-textile uses, is higher than that for textile uses, with the paint industry showing 30% growth, printing ink industry 45% and plastic industry 20%. I do not see any reason why the same pattern should not be repeated in India, particularly consi-

ing the growth potential of both the nt and plastic industries.

Having given you an idea, about what perceptions are about the future of dyes and dyestuff industry, and the ections in which it should develop, would like to dwell upon some key ues which need to be addressed gently. One of these issues relates to vironmental pollution. Your industry perceived as amongst the worst cul-ts as far as pollution is concerned. nat is more, the results of such pol-ion and environmental degradation, more visible in the case of your dustry, than with other industries such pesticides. You only have to see the lour of the river Yamuna, just as it ws by Agra, to have an idea about the voc this industry can cause, on the ality of water in our rivers. The pol-ion at this point of the river Yamuna, primarily caused by the dyes used in saree industry of Mathura.

There is a world-wide outrage against llution, and I am aware of the fact, at the pressure from environmentalists the industry in West Europe, has lped our industry in increasing its ports. However, the day is not far, hen such pressures are likely to build in our country. The industry will ve to ensure that it invests sufficient nds, installing equipments for control-ng effluents, and that it adheres to the andards for effluent disposal. This ould not be a difficult task, given the ct that the industry is located mainly Gujarat and Maharashtra.

I leave it to you to deliberate on this pect in greater details, but would like leave a thought with you, on the shar-g of the pollution control measures, ecially among the small scale units. y ministry is greatly concerned with is issue and we had recently posed a oject to the UNIDO, for developing model for checking pollution in the estuff industry. I believe that the NIDO expert has already been here, d has had detailed discussions with the representatives of the industry both in Gujarat and Maharashtra. We are still awaiting the recommendations of UNIDO, but let us not waste any time on this, and start thinking of develop-ing foolproof methods for controlling pollution. I would like you all to urgently set yourselves some specific targets for reducing the levels of vari-ous parameters prescribed for effluent treatment. This is something which the industry owes to society, and money in installing the required equipment should not be treated as a constraint.

The other issues which I would like you to address yourselves to, is the one relating to energy conservation. Like most chemical industries, the dyes and dyestuff industry is also energy-intensive and consumes huge quantities of electricity, water and steam. I need hardly emphasise the constraints, that have been imposed on us, particularly in recent times, about the use of energy, and I would like you to work on devel-oping technologies, which are less energy-intensive. I would like you to go into the details of this issues, but would emphasise the concern of Government on this issue.

Another area of concern, that I would like to emphasise here, is the need to step up the R&D efforts. Even though the dyes and dyestuff industry is fairly well-developed in India, there are large gaps in technology, in certain specific areas of dyestuff manufacture. I would, thereore, like the industry to spend more on R&D than is the case now. R&D should not necessarily mean invention of new molecules, but should focus on process research and technological upgradation, with a view to making the process not only more cost-effective, but also energy efficient and less polluting. The industry could also think in terms of pooling their resources to give a fillip to R&D effort.

I would like to emphasise the need to step up the export effort by the indus-try. I am glad to see that you are having a session specially dedicated to global marketing. We are facing perhaps our worst ever balance of payments crisis, and every dollar that is earned, is going to alleviate our critical position. The record of dyes and dyestuff industry of exports in the recent past has been commendable. The industry which was exporting only around Rs. 215 crores worth of products in 1987-88, had touched a figure of 600 crores in the year 1989-90. I would like to see these targets to be increased and to be taken to something like Rs. 1500 crores next year. I know that we have a great oppor-tunity, to export our products to the western world at this point of time, partly because of the pressure that their own dyestuff industry is facing from environmentalists, and partly because of our own efforts at achieving international competitiveness in our products. We should not allow this opportunity to slip by, but make full use of it. While on the subject I would also like you to have an in-depth analysis of the con-straints which may be faced by our exporters, as a result of the unification of the European market, which is not far away, as also the opportunities that it offers, so that we are fully prepared to meet these challenges.

In the end, I would like to thank you, for having invited me on this occasion, and for giving me this opportunity of sharing some of my thoughts with you. I am sure that the deliberations of the se-minar, will be conducted in a business like and effective manner, and that you will be coming up with some concrete recommendations. As I said earlier, my officers will all be available during the proceedings of the seminar, and we shall also take the opportunity, of responding to some of the suggestions made during the course of the day."

Four technical sessions dealing with the subjects of technology upgradation, ecology/safety, cost/economy and global marketing followed the inaugural session. Each of the sessions, consisted of two action plans -- one for the indus-try and the other for the Government.

TECHNICAL SESSION I: TECHNICAL UPGRADATION

TECHNOLOGY AS AN INPUT TO MODERNISATION

SESSION CHAIRMAN:
Prof. S. Seshadri,
Professor of Dyestuff Technology
Bombay University Department of Chemical Technology.

ACTION PLAN: INDUSTRY
Dr. P.V. Subramanian,
Director, Operations,
Colour Chem Ltd.

In his address to the audience Dr. Subramanian noted that although the industry has made significant achievements in recent years, technology was by and large outmoded and quality poor. Gaps existed in ranges of products and R&D is very limited he said. "Urgent action is called for otherwise other countries will get ahead", felt Dr. Subramanian.

While almost all classes of dyes and intermediates were being made in the country, the technologies for their production still remained dependent on the BIOS/FIAT reports and old 'classics' such as the series of books on dyestuff chemistry by Dr. Venkatraman. Any technology which was imported was far from being state-of-the-art. Many industries have been set up based on pirated know-how with consultants who were formerly employees of major dyestuff manufacturers.

The poor state of R&D has resulted in industries operating with poor plant layout, high energy consumption norms, poor energy and conversion efficiencies and inadequate facilities for handling materials. All this has been reflected in the quality of the product, felt Dr. Subramanian. While the country exported significant quantities of H. acid, BON acid, ß-naphthol, copper phthalocyanines, anthranilic acid etc. the technologies for their production still remained primitive. In the case of copper phthalocyanines in particular the risk of contamination with PCB's (polychlorinated biphenyls) remained unaddressed, Dr. Subramanian said.

Innovations in unit processes

Considerable technical improvements could be made in many of the unit processes, which formed the fundamental processes particularly in the manufacture of dye intermediates. Some of these, Dr. Subramanian felt, could be as under:

a) **Reduction** using iron-acid systems with its inherent problems of sludge disposal could be very often replaced by catalytic reduction systems.

b) Yields in **diazo-coupling** which now range around 60-70% could be increased to 95% with suitable process modifications.

c) In **alkali fusion,** use of catalysts and solvents need to be investigated.

d) A continuous process for the **Kolbe-Schmidt** reaction required consideration.

e) **Sulphonation** processes employed in the industry still utilised low concentrations of oleum. Higher concentrations, which reduced the effluent volumes, as also use of gaseous sulphur trioxide, both of which were readily available should be investigated.

f) **Halogenation** reactions were traditionally carried out by utilising only one of the halogen atoms. This represented an economic waste, not to mention effluent problems associated with frequently handling corrosive waste streams containing the other halogen. Modern technologies permitted utilisation of both the halogen atoms and these merit attention.

Innovations in dyes

Highlighting the recent innovations in the field of dyes, Dr. Subramanian pointed out the advantages of using concentrated brands and non-dusting brands, be they granulates or liquids. The use of concentrated brands has minimised the need for neutral cutting agents, although they incorporate useful additives.

Modernisation of operations

In the area of plant operations, Dr. Subramanian had a number of suggestions to give. These included:

1. the use of one pot processes obviating the need for isolation of intermediates
2. replacement of solvents by water whenever possible
3. working in closed systems, ensuring that the workers were safe from toxic fumes, dust etc.
4. conversion of batch processes into continuous ones
5. introduction of mechanisation, to reduce manual contact and physical exertion.

Need for proper instrumentation

Lamenting that process control was virtually ignored in the Indian dyestuff industry, Dr. Subramanian felt that the lack of adequate process instrumentation very often resulted in poor batch quality, and consistancy. Even basic parameters like temperature, pH, pressure, flow rates were not adequately monitored. There was urgent need for atleast this kind of monitoring, not to speek of computerised controls.

Stressing the role of innovative R&D in minimising the problems of pollution Dr. Subramaniam noted that many chemicals which were earlier considered harmless are now being exposed as environmentally devastating. Modern analytical techniques permit measurements of chemicals at even ppm and

b levels, and tireless efforts at pro-
ss innovations were required to elim-
ate the use of some of these toxics.

Regretting that very little original
ork was being done in this field and
ost work was only a replication of
ork done abroad, he urged the indus-
to focus increasingly on R&D to
ve them quality products at cheaper
ices with improved, safer technolo-
es. Some of the areas of R&D merit-
ng attention in the views of Dr.
ubramanian included:

- substitutes for benzidine based dyes
- fluorine containing reactives
- heterocyclic disperse dyes
- functional dyes, including dyes for lasers and xeroxes
- synthesis of o-cyanoazobenzenes
- heterocyclic diazo compounds.

With renewed focus on R&D activ-
ies, combining sponsors research at
niversities and institutes, and in-plant
fforts, Indian industry would ensure
peedy replacement of obsolete technol-
gy.

Responding to criticisms that univer-
ities had not done enough to improve
he lot of the dyestuff industry, Prof.
Seshadri, who was chairman of the ses-
ion, noted that industry owed a lot to
niversities in general, and the UDCT
n particular, for development of it's
man-power requirements. "Industry has
large debt to repay for this alone, and
ny additional benefits it obtains should
e regarded as a bonus", he quipped.

ACTION PLAN: GOVERNMENT

Dr. B.M. Patel,
Partner, Saptarang Industries.

Putting the Indian R&D effort against
he backdrop of the global scenario, Dr.
Patel, in his address pointed out the
paucity of the local efforts. "While the
major producers of the world spend as
much as 10-12% of their turnover, on R&D activities, our efforts are negligible", he said. "The importance of technological upgradation cannot be over-emphasised. This alone wil enable us to become leading suppliers of branded products", he added.

Dr. Patel felt that while many of the improvements in manufacture could be affected without much expenditure, in some cases replacement of older equipment by newer ones would be necessitated. "We should earmark atleast 7-10% of turnover for R&D. This is an ambitious target, and even larger units in the country are not investing these kinds of monies in R&D", he said. The reasons for this sad state of affairs, is not hard to find as most profits have ranged between 3-8% of turnover.

The key to increased financial thrust on R&D therefore lay in providing adequate fiscal benefits. These, according to Dr. Patel, could be one or more of the following:

a) **Rationalisation of excise duty:** A excise duty reduction has been suggested as a means of generating surpluses to boost R&D. Any benefit from such a reduction should be utilised for a development fund. The present and proposed excise duties are as under:

Organised Sector:
Present: 30% CE + 5% Sp. duty.
Proposed: 20% CE + 5% Sp. duty.

SSI Sector - Upto 20 lakhs:
Present: Nil
Proposed: Nil

SSI Sector - Upto 75 lakhs:
Present: 20% C.E. + 5% Sp. duty.
Proposed: 10% C.E. + 5% Sp. duty. raise exemption to Rs. 1 crore.

SSI Sector - Upto 2 crores
Present: 30% C.E. + 5% Sp. duty.
Proposed: 20% C.E. + 5% Sp. duty. raise upto Rs. 3 crores.

The new excise levies, besides generating funds for R&D would also prevent fragmentation of capacities which is now taking place, felt Dr. Patel.

b) Revive the tax deductability of 130% of the expenditure for sponsored research with universities and CSIR research laboratories.

c) Introduce a tax holiday for a period of five years in a block of eight years for products introduced by a unit based on own or sponsored R&D.

d) Provide testing and consulting facilities at universities, institutes or even technocrat managed laboratories.

e) Provide educational support to the industry by increasing the number of seats in dyestuff technology at existing institutes.

f) Include the dyestuff industry in Appendix I, to enable organised sector units covered by MRTP/FERA regulations, to invest in expansions, modernisation and R&D without having to go into cumbersome procedures.

Dr. Patel's address evoked considerable support from various members. **Shri Y.H. Desai,** Vice-President, Dyes & Chemicals Division, Sandoz (I) Ltd., felt that the lowering of excise rates would actually increase rvenues by eliminating the rampant underestimation of capacities, besides promoting efficiency.

Professor Seshadri felt that while the industry had looked at products where technology was available in the country there existed many sophisticated products required in high volume for which no technologies were available in India. "We have to look at this", Prof. Seshadri felt. He also expressed doubts over whether a scheme to pass on accruals from an excise duty reduction as inputs into R&D could be implemented successfully. "Do you have a cess" for R&D, he queried.

TECHNICAL SESSION II: ECOLOGY/SAFETY

REALISTIC EFFLUENT STANDARDS REQUIRED

SESSION CHAIRMAN:
Shri Soli Arceivala,
M.D., Associated Industrial Consultants (India) Ltd.

ACTION PLAN: INDUSTRY

Dr. O.P. Mittal,
Former Manager, Technical Planning, Hindustan Ciba-Geigy Ltd.

In his paper, Dr. Mittal pointed out that the dyestuff industry in the country is much older than most of the chemical industry, with its own set of problems, that made it a fairly hazardous industry. With a large number of industries in the country, handling a wide variety of chemicals, the industry used a range of processes and machineries frequently employing high pressures, temperature and high speed machines. The industry remained fairly labour intensive, resulting in wide exposure of workers to a range of chemicals etc.

While safety requirements in the industry had been covered in the Factories Act, recent modifications in 1987, had shifted the onus of maintaining safety at the work-place, on the occupier, who is a member of the board. The industry had been classified under Schedule I, detailing hazardous industries.

A primary requirement of the Act, has been the enunciation of a safety policy on the part of the management. The Act requires that this policy be widely publicised among the workers.

Steps to control major hazards

Dr. Mittal outlined some of the steps that industry needs to take to minimise hazards. These included:

a) Identification of situations that have potential for a major hazard;
b) examine circumstances in which this hazard may be realised;
c) identify the consequences of hazards;
d) examine methods of elimination or control which will minimise the probability of such events occuring;
e) survey the measures to be taken to mitigate the consequences in the failure of preventive measures;
f) prepare an emergency plan.

Poor enforcement

Noting that while rules and regulations regarding safety in the work-place existed, Dr. Mittal pointed out that what was lacking was enforcement. "We are lacking in discipline", he said, adding that "obedience to safety regulations should be rigidly enforced".

Moving on to the topic of environmental pollution, Dr. Mittal added that the dyestuff industry used a large number of hazardous chemicals, some of which are carcinogenic. "While effects of many of these chemicals are not known immediately, WHO documents indicate that many employees handling such chemicals get urinary bladder cancers". As many as 85% of cancers can be related to occupational hazards, he added.

Precautions for carcinogens

Considering this situation, Dr. Mittal outlined a number of steps that must be taken when handling these known or suspected carcinogens. These included:

a) use in closed systems;
b) protecting workers from exposure by using protective equipment and insisting on its use;
c) ensuring adequate ventilation in working area;
d) using a proper gas mask;
e) substituting with non-carcinogenic chemicals;

To combat pollution, Dr. Mittal o lined few strategies including the f lowing:

a) Identify potential environmental pr blems. Analyse waste products whi are revealed in air, water or soil. Da sheets on an all effluents should maintained.
b) Use technologies which limit imp on environment to an acceptable m imum.
c) Treat all waste to not only com with statutory requirements but ensure minimal adverse impact environment.
d) Design effluent treatment plants ac quately, so as to be able to hand shock loads.
e) Keep employees, public, custome and authorities fully informed of t measures taken to protect the en ronment.

Other actions that industry must ta at the planning stage itself included

a) Site selection: Preferably near the s and away from population centre
b) Product/Process Selection: Ensuri by-product recovery.
c) Waste abatement: Employing pr cesses generating lower amounts wastes.
d) Treatment at source, employi chemicals where necessary: Partic larly relevant for plants manufactu ing a wide range of products. Stre can be identified, and treated imme iately as opposed to mixing streams prior to treatment.
e) Checking air pollution: Particular in intermediate production.
f) Recognise that individual efflue treatment plants are more effecti than common effluent plants.

ON PLAN: GOVERNMENT
J. Rathi,
nan & Managing Director
shan Chemical Industries Ltd.

his paper, Dr. Rathi presented a e of an increasingly industrialis- world, wherein more discoveries ventions had been made in the last y-five years, than in the preceding years. Quoting John Nesbitt, he that while in the 18th century as as 90% of the world depended on ulture, the figure dropped to 75% e next century and further down to ow.

eferring specifically to the dyestuff try, Dr. Rathi envisaged that India l beome the largest producer of and pigments in the world pro- l it recognised the problems facing

riking a warning to industry, he d that environmental concerns were oming paramount in the minds of ple. Unless something were urgently e to tackle these issues, industry will e to pay a heavy price. "When the gets mad, no logic works and ything will get blamed on industry", warned.

Already many plants around the rld were forced into closure, due to reasing objections from neighbour- populations. "In Taiwan many pes- de plants have been shut, since the Bhopal incident", he said.

Enlisting some of the causes of pollution, Dr. Rathi blamed inadequate attention, lack of modernisation and poor housekeeping as major culprits. There were very little efforts at waste minimisation, waste recovery and source reduction of pollutants.

Standards too stringent

A curious anomaly in Dr. Rathi's paper was his observation that while efforts in environmental pollution control were inadequate, very often the specifications laid down for certain emissions were more stringent than those of the Environmental Protection Agency (EPA) in USA. As one example, he pointed out that the US EPA seldom specifies COD (Chemical Oxygen Demand) levels, preferring to lay greater stress on BOD (Biological Oxygen Demand).

"In hexavalent chromium, Indian Standards are 0.05 mg/l, while US EPA levels are monthly averages of 1.1 mg/l, and even a one-day discharge of 2.77 mg/l is permitted", he said.

According to Dr. Rathi, several such instances as in levels of lead, combined cyanides etc. could be cited, where unnecessarily strict emission levels had been imposed. "The Government should specify economically achievable standards, unformly throughout the country, keeping in mind the Best-Available-Technologies (BAT) and the Best-Practical-Technology (BPT)", he said.

Locational policy

Calling for some reconsideration of the existing policy to allow chemical industries to come up in coastal areas only, with the sea serving as a convenient and economical repository of wastes, Dr. Rathi pointed out that recent studies in irrigation with treated water, had opened up a new outlet for these waste streams. "The technologies for the treatment are available and the locational policy may need a change", he said.

R & D thrusts

Urging SSI units to do at least primary treatment of their waste streams such as neutralisation, solids removal, removal of colour etc., Dr. Rathi called for study on the treatability of complex wastes from the SSI units. Other areas requiring the attention of R&D efforts included:

a) establishing BAT and BPT standards
b) studying major chemical processes for reduction of pollution
c) making environmental impact studies for major chemicals
d) preparing a blue-print for planned development of similar industries, in industrial estates.

SSION III: COST/ECONOMY

KEY RAW MATERIALS AT INTERNATIONAL PRICES

SSION CHAIRMAN:
ri H. Krishnamurthy
airman & Managing Director,
dras Refineries Ltd.

n his introductory remarks, Shri shnamurthy, who as former chief at Hindustan Organic Chemicals Ltd., l been a key figure in the dyestuff

take steps to increase exports and the per capita consumption of dyes domestic by an order of magnitude. "Cost is a vital factor", he said, admitting that this was high in India due to a multitude of factors including high costs of intermediates, utilities like power, fragmentation of capacity with consequent lack of economies of scale, etc. Considerable scope lay in cutting down production costs, he opined, laying the tone for the two papers to follow.

ACTION PLAN: INDUSTRY
Mr. B. Rajagopal,
General Manager, Marketing,
The Atul Products Ltd.

Outlining the status of the Indian dyestuff industry, Mr. Rajagopal

pointed out Indian production at 3.6% of the world production of 1.1 million tonnes, was a insignificant presence. "With worldwide changeover to other industries, due to inadequate returns from traditional industries, India is presented with an unequalled opportunity", he felt.

To meet the increasing demand from round the world, capacities in dyestuff production would have to be increased, Mr. Rajagopal felt. "Infrastructural facilities, and other inputs including man-power will also have to go up", he noted.

"A major constraint in exports is the disparity in prices between Indian and international levels", he said. As an example, he cited two key intermediates viz. H. acid and beta-naphthol. While indigenous prices ruled around Rs. 74 and Rs. 40 per kg. respectively, intenational prices were as low as Rs. 35 and Rs. 15 per kg. respectively. "Comparative costs for a number of other products are no different. These differences make Indian products uncompetitive", he said.

Actions from industry

Outlining an action plan for cutting costs, Mr. Rajagopal, urged industry to take steps to:

a) Maximise yield and optimise consumption norms in respect of raw materials, and utilities by process improvements.

b) Benefit from economies of scale, by building bigger plants, using better processes and modern (computerised) on-line process control systems.

c) Improve effluent disposal and waste recoveries, not merely to comply with legislation but from the point of economy.

d) Keep better maintenance standards, reducing downtimes.

e) Upgrade man-power skills for a better contribution

f) Introduce automation in handling of materials.

g) Maintain better quality by appropriate methods both in inputs and outputs.

h) Improve inventory control, as a means to control interest costs.

ACTION PLAN: GOVERNMENT

Mr. Ajay Kadakia,
Director, Vivid Group of Industries

In his paper, Shri Kadakia, urged a review by the Government of the feedstock pricing policy as also the impact of multi-point taxation on cost escalation. He emphasised the need for rationalisation of 'deemed export' procedures and for abolishing octroi and sales tax on deemed exports.

Detailing the high cost of inputs in the country, Shri Kadakia pointed out that on an average basic feedstocks required by the industry were about 1.73 times costlier in India, while intermediates were dearer by 1.86 times on an average.

While parity with international prices would be ideal, Mr. Kadakia was realistic enough to suggest that prices for exporters, be brought down to a level around 1.4 times the international prices. This will give a boost to the industry's exports, said Mr. Kadakia.

On the topic of multi-point taxation, Shri Kadakia, eloquently pointed out with examples, that the complexity of chemical production and particularly dyestuff manufacture meant that, a single dyestuff went through as many as 7-8 steps in its manufacture. At each of these stages levies such as octroi, sales-tax and turnover tax added up, to ultimately come a significant part of the cost of the final product. For example the conversion of naphthalene to an orange dye through a 5-step manufacture, totalled up a levy of 40.3% of product cost as under:

Cumulative incidence of sales-tax
(in paranthesis)

Naphthalene
↓
ß-Naphthol
(5.2)
↓
Tobias acid
(7.6)
↓
J. acid
(13.14)
↓
N-Methyl J. acid
(18.5)
↓
Orange dye
(40.3)

Similarly the conversion of benz to a yellow dye through a 4-step m ufacturing process, totalled up a lev 18.39% as below:

Cumulative incidence of sales-tax
(in paranthesis)

Benzene
↓
Monochlorobenzene
(6.5)
↓
2,4-Dinitro-chlorobenzene
(11.94)
↓
m-Phenylenedisulphonic acid
(MPDSA)
(8.66)
↓
Yellow dyes
(18.39)

With cash compensatory suppor 10% for intermediates and 12% dyes, insufficient to compensate the c cading effect of multi-point taxation, only remedy remained in a rationali tion of these tax structures.

Deemed exports

Shri Kadakia felt that deemed expo should be accorded a status on par w exports particularly with respect to d draw-back and advance licence fac

"Procedural delays are considerand should be eliminated", he d.

he interest on long term borrowings 4% was much higher in India as pared to other countries of the ld, and this was also making Indian stry uncompetitive, said Mr. akia in conclusion.

his session on costing predictably ught an enthusiastic response from audience. A member of the audience gested that the debt/equity ratio for ort oriented units be more favour- modified.

A keen debate ensued on Hindustan Organic Chemicals (HOC's) credit policy (or the lack of it). Most members felt that it was only fair that HOC, give it's valued customers some credit facility, especially in view of the fact that consumers of dyestuffs almost always demanded and obtained such a facility. Shri Krishnamurthy, who participated in the discussion noted that HOC, was not very often in a position to provide credit as it had to make immediate payments for its' purchases of raw materials like benzene, etc.

Replying to a query from a member of the audience as to why feedstock prices were so high in the country vis-a-vis the rest of the world, Shri Krishnamurthy noted that prices of petroleum products were fixed in a manner adapted to the socio-economic milieu prevailing in the country. Based on this an overall scenario in pricing is arrived at, and any reconsideration of prices would be carried out only after taking a complex range of issues into account.

An across-the-board decrease in prices of petroleum products was unlikely, Shri Krishnamurthy felt, at the same time acknowledging the fact that there was a need to review prices. "While complete parity with international prices is not possible a little decrease will go a long way", he concluded.

SSION IV: GLOBAL MARKETING

TOTAL COMMITMENT TO QUALITY

SSION CHAIRMAN:
. M. Knoll
rketing Director,
lour Chem Ltd.

The session called for the induction the total management concept by npanies and a renewed thrust on rket research to achieve a greater rket share. Government was urged to vide better infrastructural facilities l simplify procedures regarding orts.

CTION PLAN: INDUSTRY
r. Y.H. Desai,
ce-President, Chemicals,
ndoz (I) Ltd.

The challenge facing the industry is increase exports from current levels $330 million to $1000 million by 95, said Mr. Desai. Growth to the esent levels was achieved by a comnation of a number of favourable fac- s including:

a falling rupee
forced restructuring of lead players for strategic and economic reasons
global reduction in brand loyalty
demonopolised markets in intermediates
excess production capacity in India
entrepreneurship of Indian businessmen.

Factors which have worked against the interests of industry included:

- cost, economy and technology gaps
- poor quality performance
- credibility gap
- poor image abroad
- focus on prices and commodity selling
- procedural and infrastructural bottlenecks
- lack of professional marketing.

As the ability to retain market share would depend largely on an understanding and satisfaction of global needs, Mr. Desai outlined a four-pronged action plan to achieve a better representation in exports. These included:

a) Eliminating the credibility gap, by never committing to what one cannot deliver; adopting a total quality management concept and by modernising with investments in sophisticated instrumentation for process control and analytics.

b) Having a better understanding of markets and customers, through a systematic information gathering system permitting analysis of key market factors and competitive forces.

c) Improving the product mix, to permit enlarged market penetration in newer, high value products and increased sales to newer markets.

d) Changing from commodity to brand selling with a shift in focus from price to customer, and from demand satisfaction to customer satisfaction.

Mr. Desai also urged companies to form marketing alliances to eliminate unhealthy internal competition.

ACTION PLAN: GOVERNMENT
Mr. Sharad Kothari,
Managing Director,
Jaysynth Dyechem Ltd.

Presenting an action plan for the Government, Mr. Kothari opined that competition from Korea, Taiwan, Thailand, Indonesia, China was likely to intensify. He urged greater efforts at marketing and promotional activities,

involving the commercial attaches in Indian embassies for collecting information, and providing incentives for opening branches abroad. He urged Indian entrepreneurs to avoid undercutting in exports and even explore the possibility of setting up a trading houses if necessary.

Calling for a simplication of procedures and regulations, Mr. Kothari requested the Government to prescribe time limits for by departments to process papers, to provide clearance under one roof, and treat deemed exports on par with exports for availing of facilities.

Fiscal support

Mr. Kothari also urged the government to remove the foreign travel tax for export promotion trips, and suggested that a pro-rata tax holiday should be given to units exporting atleast 25% of their production, as is done for export oriented units.

To ensure adequate supply of raw materials he urged the Government to formulate a long term strategy keeping in mind the export targets. At times of shortages he felt that, quick imports were required to ensure continuity of production.

Infrastructural facilities

The Government should ensure that facilities such as communication, transport, were readily available. By way of incentives for quality production, Government should rigidly enforce patent rights, provide fiscal incentives for R&D and remove all duties on technology transfer. Other common facilities which could be considered for implementation included, warehousing facilities abroad; and testing and analytical facilities for better quality control.

CONCLUDING SESSION

The last session of the day was taken up by the dignitaries from the ministry of Petroleum and Chemicals, who responded to many of the suggestions which were thrown up at the meeting.

Mr. R.S. Mathur, Joint Secretary (Chemicals), Dept. of Chemicals and Petrochemicals who initiated the proceedings graciously accepted many of the suggestions made during the day. Commenting on the proposal to reduce excise duty making available funds for R&D, he noted that such incentives for R&D had been engaging the attention of the Government. Concessions in excise was one a series of measures being looked into. He also urged the industry to come up with other suggestions. However, Mr. Mathur was slightly sceptical on the possibility of enforcing the idea as suggested by the DMAI.

As regards inclusion of the industry in Appendix I, with open entry for FERA/MRTP companies, he indicated that there would be disunity in the Association as regards such a suggestion, making an obvious reference to the SSI sector which would not take too kindly to such an amendment.

In the context of the unrealistic standards in pollutants, Mr. Mathur promised to take up the matter with the environment ministry. "The distillery industry has also raised this point", he said. The public perception of the industry is that it is a polluting one, and any relaxation of standards, however pragmatic, is not likely to go down favourably with the public, he warned.

On the pricing of raw materials, Mr. Mathur noted that the pricing policy of chemicals and intermediates was a part of an overall policy on pricing of petroleum products and in the preparation of such a policy the users point of view does not find much consideration. As regards the interest rate structure, he was not very optimistic of rates coming down to levels prevailing in countries like USA or Europe.

Mr. Mathur urged the industry to consider the problem of undercutting in exports, and come up with a solution The Government was not very keen to interfere in this matter, he said, adding that it was nevertheless concerned over the loss in revenue.

Commenting on raw material availability, he noted that the Government was keen to remove the aberrations that came up in monopoly markets, and consequently has thrown open manufacture of many intermediates and raw materials to the private sector.

Mr. M.S. Murthy, Advisor (Chemicals), Department of Chemicals and Petrochemicals, urged the industry to ensure strict implementation of the provisions of the Factory Act. He also suggestd that DMAI, set up a co-operative research centre to tackle the problems of its members.

In his concluding address, **Shri M.S Gill,** Secretary, Ministry of Chemicals and Petroleum, urged the industry to lay stress on quality, in its own interests "The Japnese have overcome these problems and we have to", he added.

Mr. Gill promised incentives from the Government for R & D, but urged industry to develop an attitude to R&D as a necessary means for survival.

The meeting concluded with a vote of thanks by Shri P.R. Rastogi, Secretary, DMAI.

A few reprints of the proceedings of the seminar are available

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OIL, GAS EXPLORATION

70 more blocks for bidding

The Department of Petroleum is likely to offer about 70 blocks in the fourth round of bidding for exploration of oil and natural gas by foreign companies. The terms and conditions will also be liberalised and are expected to be finalised by the end of December. According to sources in the ministry, the government has little choice but to offer such a large number with liberalised terms so that the foreign companies find it viable to participate.

In the third round of bidding, 27 offshore blocks were offered. However, bids were offered for only nine blocks to five international companies. However, from these nine, four companies have withdrawn from about another block in Kerala-Konkan Basin after the first phase was completed. This had upset country's exploration programmes to a large extent and the foreign companies also do not want to invest further after they draw a blank in first try because of stiff tender norms offered by the Department of Petroleum.

Officials point out that if the tender norms were more attractive, the international companies will like to stay back and re-explore the area where they draw a blank in the first try. However, because of stiff conditions, it becomes unviable for the foreign company to invest further in the same area. In Saurashtra offshore, for example, Chevron of the US had drawn about three dry wells. However, the seismic survey, conducted by the Chevron itself and also by the Oil India Limited (OIL), this offshore basin has lot of potential.

Hence, on the advice of the centre, the state government has granted a Petroleum Exploration Licence (PEL) to OIL to take up the exploration activity in the area where Chevron had failed thrice.

Disturbed over the low interest t by the international companies exploration works in India and sul quent withdrawal of those who par ipated, the government had set u committee, headed by Mr. Lo Kumar to work out blocks to be offe in the fourth round of bidding. committee identified 62 blocks onshore and 33 offshore) for invit bids. However, by the time the co mittee report was submitted, a few m companies withdrew and some unc cially indicated their intention of w drawing. Hence, the Department Petroleum has while accepting committee report decided to add six seven blocks more to what was rec mended by the committee.

Shell had taken up two blocks in Konkan-Kerala offshore. It after hav withdrawn from one already, expres its desire to withdraw from another. US consortium of Chevron-Texm has withdrawn from all four block had offered to explore in the third ro of bidding immediately after the stage. Another US company, Amoc also keen on withdrawing from Krishna-Godavari offshore block.

The fourth round of bidding will for maximum number of blocks much more liberalised terms, offic point out. In the first round of bidd in 1979, about 32 blocks were offe (15 onshore and 17 offshore). Howe only three were taken up. In the sec round of bidding, about 50 blocks w offered (eight onshore and 42 offsho However, no contract was signed w any company.

In the third round, 27 blocks w offered. Contracts for only nine w signed with five companies. The companies were Chevron-Texm (US), International Petroleum L (Dubai), BHP Petroleum (Austral Shell (Netherlands) and Amoco (U These companies have toget acquired new seismic data of 20543 kms., drilled about five wells till the of 1989-90 and spent a total sum about $50 million.

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NGC's drilling efficiency on the rise

drilling efficiency of Oil and l Gas Commission (ONGC) ally called cycle speed has an increasing trend over the last ears. The cycle speed measured ns of metres drilled by each rig onth has increased from 675 in 38 to 679 in 1988-89 and further metres/rig month in 1989-90. The speed is an important parameter ess the drilling efficiency as it the entire gamut of the total dril- perations.

drilling process is one of the critical inputs in the exploration s and any increase in the drilling ency contributes in a very large to the overall improvement in ctivity and reduction in the costs. ost of drilling takes away as much lf the total expenditure on explo- and production. A multipronged ach adopted by ONGC has not on- ped in reducing the effective time fferent activities and improving ctivity but in also increasing the speed of drilling. A strong empha- as been laid by ONGC towards ology improvement. Mobile rigs been introduced for shallow dril- o cut down the transportation and ng time. The induction of specialty t rigs has helped in overcoming the lem faced in transportation of the in the desert areas.

e organisation is also trying to gain rtise in horizontal drilling, which dramatically boost the field's oil uction and ultimately the profits. zontal drilling technology is the la- state of art technology and very few tries possess it. ONGC has so far successful in drilling seven such s in offshore and more such wells planned to be drilled at Khoraghat am), Balol Lanwa (Gujarat), Panna, h Bassein and Bombay High.

he use of computer aided drilling in hore rigs introduced in the eastern on has helped in solving the com- plex problems encountered during the drilling operations. The computerisation of rigs introduced in eastern region would provide online data and provide the required technical application software to the drilling engineers at the rig site. The introduction of measurement while drilling technology has demonstrated its usefulness in monitoring directional drilling and hole deviation, thus vastly improving the efficiency of the drilling operations.

The optimisation of hydraulic parameters and careful consideration regarding the selection of bits has also increased the rate of penetration considerably and has reduced the number of drilling bits in many cases to half. The use of the polycrystalline diamond compact bids and other hybrid bits has also significantly improved the rate of penetration. The adoption of the appropriate drilling fluid systems has resulted in a saving of a number of rig days and has avoided delays caused by caving shale, struck drill pipes, loss of circulation etc. For onland fields, the use of cluster drilling has considerably increased the cycle speed and also reduced the cost of land acquisition.

ONGC TO HAND OVER SMALL GAS FIELDS TO GUJARAT

The Gujarat Chief Minister, Mr. Chimanbhai Patel said the Oil and Natural Gas Commission (ONGC) has agreed to hand over small and scattered gas fields in Gujarat to the Gujarat Government for exploitation. Speaking to reporters at Baroda on November 23, Mr. Patel said that the details of this plan, including a number of such gas fields were being worked out by the ONGC. Natural gas from these outlets would be used for setting up micro gas-based power plants of two or three MWs at the site of the gas emission or small industrial units which could use the gas as fuel.

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Chandrajyoti oil substitute for diesel?

Can "Jatropha Curcas" (Equphorbicaes) oil, known in India as Moglaerand, Baghierand, Chandrajyoti, Chandraprabha or Nepalam , be a substitute for diesel? If analysis by petroleum consultants of Thailand is any indication, the Jatropha Curcas oil could positively replace diesel, former Maharasthra minister, Vinayarao Patil said at an All India seminar on "Modern techniques of rainwater harvesting, water conservation and artificial recharging; on November 10.

A "Kubota" four-stroke cycle diesel engine (seven hp/2200 rpm, with a simple horizontal piston, a cylinder volume of 400 cc, and a water cooling system) and a "Yanmar" diesel engine (horizontal four cycle, seven hp/2400 rmp of precombustion type) usually run on liquefied petroleum gas (LPG) and diesel respectively, were tested for comparative performance against running on Jatropha oil.

The results showed that engine performance and fuel consumption were favourable and the inspection of Kubota diesel engine parts, when run on Jatropha oil for 1,000 hours, were also satisfactory, Mr. Patil said after presenting his paper at the conference. Mr. Patil said, when compared with diesel oil for exhaust gas tests, the differences in smoke and carbon monoxide content were not only negligible but the values were also lower than the accepted values as per the standard specifications of the environment board.

Mr. Patil said Jatropha Curcas, adapted to arid and semi-arid conditions, has low fertility and moisture demand and can come up on stony, gravelly or shallow and even calcarous soil. It can be propagated from seeds as well as cuttings. He said, 1,500 litres of oil could be extracted from the yield per acre of 5,000 kg of Jatropha Curcas in irrigated area and 400 litres oil from 2,000 kg yield per acre in unirrigated areas. Stating that the country imports Jatropha oil worth about Rs. 400 crore annually, Mr. Patil felt that cultivation of Jatropha should be taken up on a massive scale all over the country.

JAPAN IMPORTS 70 PER CENT CRUDE FROM WEST ASIA

Japan which has the second-most powerful economy in the world, possesses almost no energy reserves and imports 70 per cent of its crude oil from the troubled West Asia. The country pollutes the air with 312 million tonnes of carbon dioxide per year, one of the gases responsible for the greenhouse effect, the overheating of the earth's atmosphere. Japan, which has elevate economic growth to a vital principle lik no other nation in the world, has fu thermore been acting as if the import energy were a national obsession. Th has been observed since it becam caught between an oil crisis due to th August 2 Iraqi invasion of Kuwait an repeated international demands that cut down its emissions of the noxiou gases. To weaken Japan's dependenc on West Asian oil and to silence cri icism from environmentalists, the Cab inet of Premier Mr. Toshkiki Kaifu la month adopted a longterm energy stra egy based on a massive expansion of th atomic energy sector. According to th plan, 16.9 per cent of the energy outp in the year 2010 will be produced b atomic reactors up from 8.9 per cent la year.

ARGENTINA, CHILE GAS PIPE LINE PROJECT

A consortium of nine American com panies has presented a project construc ing a gas-pipeline between Equuina Chosmalal and Santiago de Chile. Th consortium includes five Argentinia two Chilean, one Spanish and one U company. For Argentina, this proje would help earn more foreign exchang and promote the gas and oil industry b increasing the potential for exploitin natural gas resources.

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rime Minister rules out immediate cut in petro goods prices

The Prime Minister, Mr. Chandra ekhar, recently indicated that the vernment may not immediately uce the prices of petroleum products. lking to a group of newsmen, he said f the international prices of petroleum oducts comes down and the Gulf sit- tion stabilises, we will consider reduc- n in the hike".

The Government did not want to duce prices of petroleum products w and raise it again if the Gulf sit- tion deteriorates, he said. The Petrol- m and Chemicals Minister, Mr. Satya rakash Malaviya, had said recently that e Government was reviewing 25 per nt hike in prices of petroleum pro- ucts raised in the wake of the Gulf risis.

Talking about the price rise and the elicate economic situation, the Prime Minister said the country was undoub- edly facing a difficult period. He said here was, however, no need for panic s the problems could be overcome hrough improved financial discipline.

The government is considering a eview of the 25 per cent hike in the rice of petroleum products in the wake of the Gulf crisis. Earlier on Nov. 25, the Union petroleum and chemicals minister, Mr. Satya Prakash Malaviya, told reporters at New Delhi recently that while the 20 per cent cut in use of petroleum products would continue, diesel would be exempted.

He said the exemption in diesel consumption will come into effect from Nov. 26th. This will primarily help the agriculture sector, he added. The government will also review all decisions of the V.P. Singh Government taken after October 23, the day Mr. Singh had been called to prove his majority by the President following withdrawal of support by the BJP. The Prime Minister had directed all ministers to review post-October 23 decisions, Mr. Malaviya added. With dwindling oil supply and the price of imports skyrocketing due to the political imbroglio in West Asia, the government had effected a steep hike of 25 per cent in the price of petroleum products in early October in a desperate effort to curb demand and arrest further deterioration of the balance of payments position.

However, the hike in prices did not result in any reduction in the consumption of petroleum products — especially petrol and diesel. The deployment of the army to handle the recent communal riots and security needs on the Indo-Pak border contributed their share to the demand for oil. As a result of the 25 per cent hike in petrol and diesel prices, the prices of most commodities have gone up by upto 40 per cent at the retail outlets all over the country. If the 15 per cent cut in diesel supply prevailed, the railways were expected to lose traffic to the tune of 40 million tonnes, which would have made a direct and indirect impact of Rs. 1,000 crore on its finances. (The 20 per cent oil cut announced was not applicable to the railways).

The Union deputy minister for petroleum and chemicals, Mr. Jai Prakash, said in Hissar on Nov. 25, that the Centre had withdrawn the cut in diesel quota to Gujarat, Haryana, Punjab, Rajasthan, Madhya Pradesh and UP in view of the rabi sowing season. The minister told reporters at New Delhi that the government had formulated a scheme for opening new diesel stations every seven km so that farmers could easily get diesel.

The Central government, Mr. Jai Prakash said, had decided to buy oil from Japan, the USSR and other countries in case of any reduction in oil imports from the Gulf countries.

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Excise off on recycled oils

The Central Board of Excise and stoms (CBEC) has exempted re-ning of used lubricating oils from ise duty in order to popularise recyc-g of oils and to step up availability automotive and industrial grades of ricating oils and greases.

The CBEC directive is likely to be maximum benefit to Castrol India d., which is the leader in the annual ,000 tonnes used lubricating oil refin-g market.

The company's working in the cur-nt year has been under pressure from e 15 per cent out on petroleum pro-cts supply and 25 per cent hike in ices.

It may be recalled that as a precon-tion to Castrol's presence in India, the entre had stipulated that the company ould have to set up a used lubricating l re-refining plant to be eligible for an ssured supply of imported base lubri-ting oils.

Many more re-refining units were ter set up in the private sector. Re-fining, which was earlier not regarded s manufacture under section 2(f) of the Central Excise and Salt Act, 1944, was ecently dragged into the excise net as BEC clarified that the activity mounted to manufacture and should ttract an excise duty of Rs. 3,675 per onne.

Castrol India and the other re-refiners nade a joint representation to the minis-ries concerned. It was argued by the ndustry that once the excise authorities erve showcause notices on the re-efiners and levy excise duty on the re-efined lubricating oil, the profitability f many re-refiners might be affected nd could ultimately result in short sup-lies.

Castrol India has lube oils re-refining nits at Patalganga and Calcutta with a otal installed re-refining capacity of 14,000 kilo litres. Indrol Lubricants and Specialities Ltd. was rechristened Castrol India Ltd. with effect from November 1, 1990.

Speaking to newsmen at the launch of Castrol's new engine oil — GTX-2 recently Mr. R.A. Savoor, chief executive and managing director, said that Castrol India will soon launch a host of products already developed and successfully launched by Castrol UK in the international markets.

The emphasis, Mr. Savoor said, would be on specific product categories. While GTX2 is specifically targeted at the automobile sector, Castrol India will soon launch a range of engine oils to suit the individual needs of scooters, two-stroke 100CC motorbikes and mopeds.

Asked why Castrol UK had chosen to limit its investment in Castrol India to only 40 per cent of the equity capital, Mr. Savoor replied that it was to avoid the Fera strictures and to impart a definite Indian identity to the company. He also denied that Castrol UK was planning to dilute its holding.

GTX2 is a new generation engine oil and has proven energy conserving qualities. Castrol India is the first Indian company to be licensed to display the "donut" symbol of the American Petroleum Institute. Of the 900,000 tonnes total market for lubricants, the three public sector oil companies have 90 per cent share. Castrol has around 5 per cent share. Its allotment of imported base lubricating oils is decided on this basis. Castrol recommended a bonus issue of three new equity shares for five already held for the nine-months ending March 31, 1990. This will require capitalisation of Rs. 3.69 crore. The company achieved a total income of Rs. 118.90 crore during the period under review.

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Corporate steps urged to check pollution

Protection of environment should be a corporate effort and industries should concentrate on minimisation of wastes and selection of right raw materials, according to Mr. C.D. Oommachen, Chairman, Maharashtra Polluton Control Board.

Inaugurating a two-day seminar on the latest advances in pollution abatement technologies alongwith an exhibition organised by the Confederation of Engineering Industry (CEI), Western region, at Bombay on Nov. 26 Mr. Oommachen said environment acts were "paper tigers" as social legislation.

He called for support both from society and industry, to implement environment acts. Environment control and monitoring equipment were significant instruments of overall environment protection, he said. The Maharashtra Government had made it compulsory for industries to cover one third of open areas with trees, he said, adding that industrialists could play a major role in the greening of the country.

Earlier, Mr. Jamshyd Godrej, CEI immediate past Chairman, reiterated the significance of environment protection. Mr. Godrej said the environment policy should be an integral part of the overall development policy.

Mr. Godrej said the environmental policy should be more than mere lip service and its target should be towards sustaining ecological development.

Mr. F.A.A. Jasdanwalla, past president of CEI, said industries had a special responsibility to society and the concept of pollution control, at the source of generation, should be promoted.

Over 150 senior industry representatives are attending the seminar.

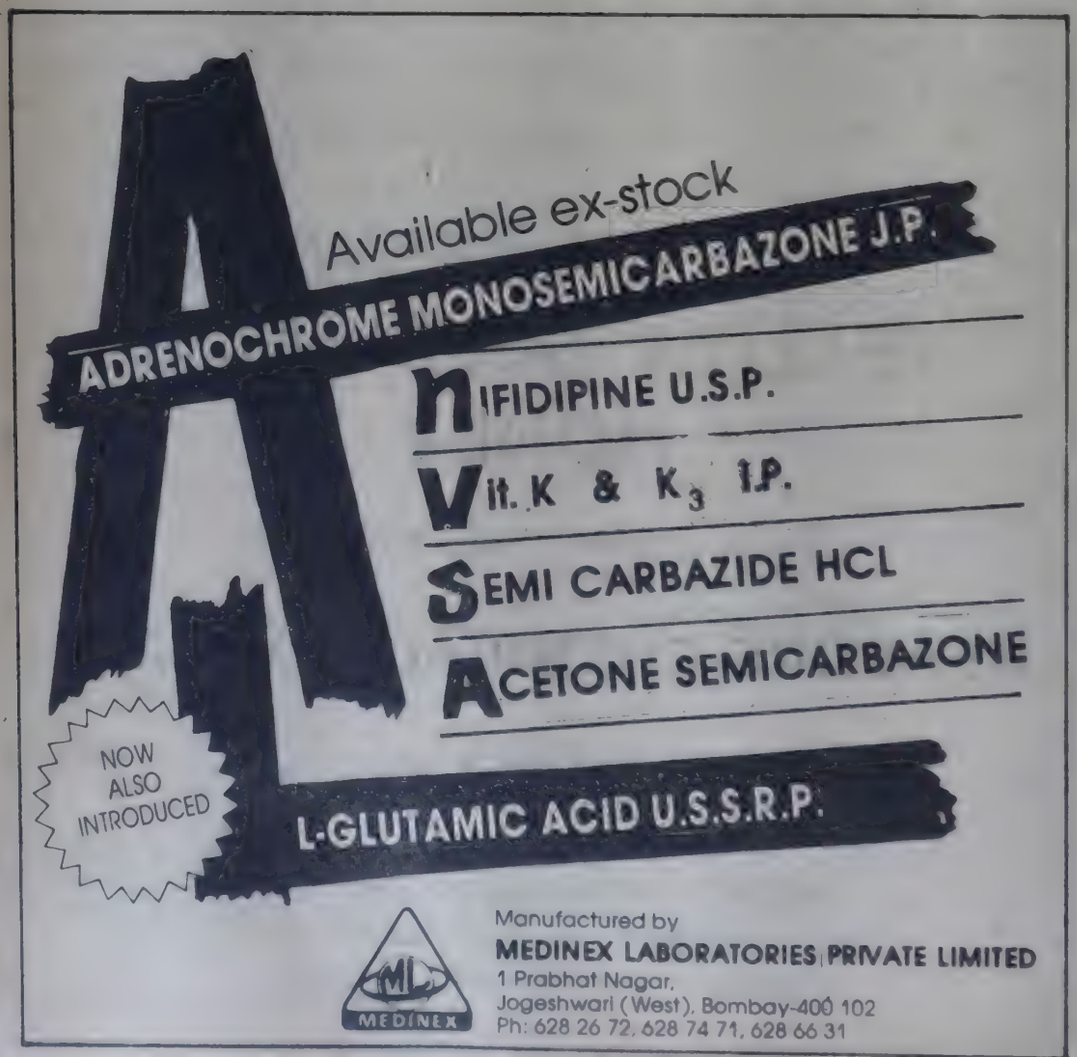
IBRD choses Bombay for environment project

Bombay is one of the four maj cities in the world besides Beijin Mexico City and Jakarta, identified b the World Bank for a major enviro ment assessment project. This w stated by Mr. U.K. Mukhopadhyay, se retary, energy and environment, gov ernment of Maharashtra at th valedictory session of a seminar c latest advances in pollution abateme technologies organised by the Confe eration of Engineering Industry (Wes ern Region). A World Bank team wou be visiting Bombay shortly for this pu pose. Mr. Mukhopadhyay added that th sewerage project of the Bombay Muni ipal Corporation is to be finalis shortly.

Speaking about the environment problems in Maharashtra, Mr. Mukho padhyay pointed out that chemic industries, dyestuff industries, distille ies and generation of methane gas fro garbage were the major sources of po lution. The major problem areas we Chembur, Thane-Belapur, belt, Tarapu Dombivli and Roha.

In this context he pointed out th common effluent treatment plan would be set up with World Bank assi tance at the Thane-Belapur belt, Tar pur and Dombivili. Mr. Mukhopadhya pointed out that the strategy of th Maharashtra government for environ ment and pollution management woul be: to identify areas where the pollutio level is serious, taking precautionar measures for pollution control in the in tial stages itself in new areas, plantin as many trees as possible.

Mr. Mukhopadhyay said that man agement of the environment should b of prime concern and industry shoul take a positive view of it. Mr. Mukho padhyay urged industry to interac closely with the government on envi ronment problems.



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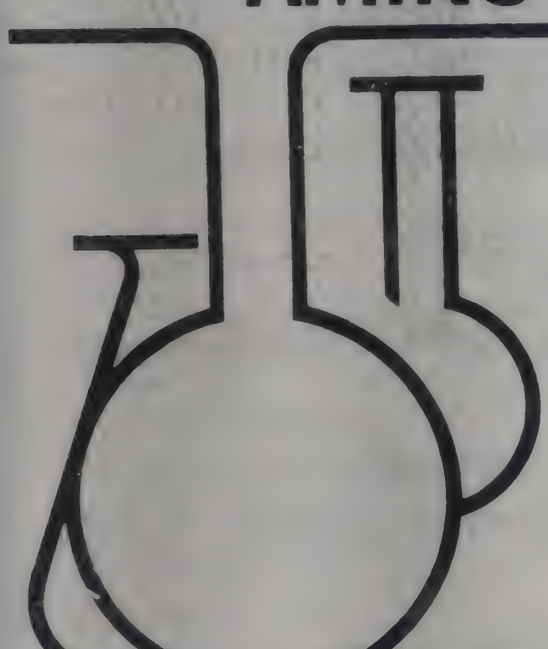

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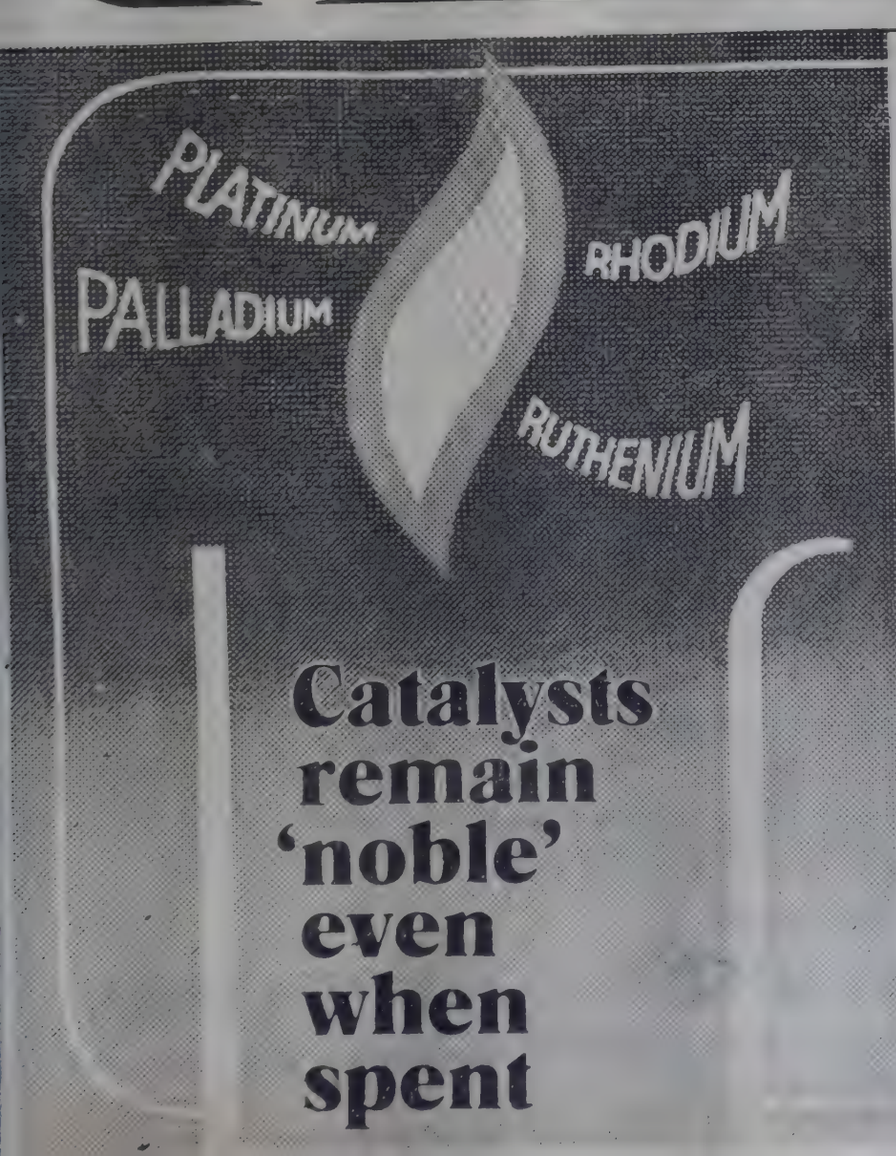

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ly ash unit near Farakka planned with Japanese aid

Fly ash is a versatile material that can put to many productive uses instead being treated as a polluting waste, as present. Towards this end, a panese-aided fly ash processing unit being set up near the Farakka ther- l power station to make aggregate for e in road and civil construction. The en 177 million project will be funded part by OECF and will use Japanese chnology. This was announced by M. abir Sengupta, state minister for wer and public health engineering.

Speaking at the seminar on Fly Ash ricks organised at Calcutta jointly by entral Fuel Research Institute (CFRI), ational Research Development Cor- oration (NRDC) and CSIR — Poly- chnology Transfer Centre, Mr. engupta said fly ash was even used to nake fertilisers in Japan. Yet it was eing wasted in the state. "At a recent neeting in the chief minister's chamber, ne state government had suggested to Coal India Limited that fly ash from power stations should be used to fill bandoned mines to check subsidence n certain parts of the state. But no ction has been taken", the minister aid.

The state government was ready to supply free ash and provide land to any entrepreneur willing to set up units to process fly ash, the minister announced.

Congratulating the organisers for bringing together several agencies to chalk out a policy for fly ash use through the seminar, Mr. T.C. Dutt, the state chief secretary, said subsidies, sales tax relief and other support for fly ash processing units should be combined with disincentives for traditional brick kilns to make fly ash bricks competitive.

In this context, Mr. Dutt said the destruction of top soil by brick kilns had to be stopped. The chief secretary said the possibility of setting up a fly ash unit near the Dankuni Coal Complex of Coal India Ltd. should be examined.

Dr. D.K. Bose, chairman of West Bengal State Electricity Board, pointed out that western nations put fly ash to various uses, ranging from construction to landscaping.

But as the use for bricks or other products had not caught on in India, the government should finance or subsidise the development and establishment of this technology.

INDIA, AUSTRALIA TO STEP UP CO-OPERATION IN FIELD OF COAL

Cooperation between India and Australia in the field of coal is expected to be intensified as a result of a meeting of the joint working group on coal, expected to take place.

The first meeting of the group, which aims to identify new areas of business co-operation in coal development took place in Canberra in July 1989.

Last year Australia had offfered to assist India in the development of Piop- iparwar project. It will have an annual production capacity of 6.5 million tonnes of raw coal to yield 5.5 million tonnes of beneficiated coal.

Coal from the project will be supplied to national capital thermal power project at Dadri in Uttar Pradesh and Yamunanagar thermal power project in Haryana.

The production and import of coal has assumed importance following the Gulf crisis, to maintain and if possible step by the generation of thermal power to restrict the use of diesel and petrol in private generating sets to the minimum.

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Titanium: new hopes

Blessed with good reserves of titanium — a material for the future — India can utilise this important mineral both for exports and domestic applications. Experts have underlined the need for conducting a detailed market survey regarding application of titanium and tapping its export potential.

Although India is favourably placed as far as the reserves of titanium are concerned, nothing significant has been done to tap the potential applications of this important futuristic mineral.

At a workshop on titanium organised recently by the Confederation of Engineering Industry (CEI), it was felt that a proper market survey should be carried out to assess the current and the future demand for titanium in various mill forms and fabricated shapes in India.

The mineral is important because of its varied applications in high-tech industries. Titanium has been described as the 'strong middleweight' amongst metals and its alloys have attractive design propeties. The important properties of tianium include high strength-to-weight ratio over a wide range of temperature, excellent corrosion resistance especially in sea water environment and its alloys have a creep rupture strength similar to that of steel though it has half the density of steel.

Also the continuous research and development efforts world-wide have resulted in improved fabrication methods. The fabrication of titanium and its alloys to near-net-shape has become possible by isothermal forging, powder metallurgy, superplastic forming, diffusion bonding, centrifugal casting, hot isolatic pressing and laser wielding.

The improved methods of fabrication have reduced the scrap losses and fabrication time. This has ultimately resulted in reduced cost and increased availability. The various unique attributes and metallurgical properties of titanium have made it indispensable for various industrial uses in spite of the high initial cost. As much as 50 per cent of the world's total output is utilised by the aerospace sector which include aircraft, missiles and space vehicles.

The next major user of titanium is the chemical and allied industry which consumes around 20 per cent of the world's production. Titanium is used in fabrication of Ti-anodes in the cholor-alkali sector, metal anodes, heat exchangers, columns, urea strippers, electroplating accessories and valves. Titanium is also used in various forms in sectors like power generation, marine and off-shore drilling, paper and pulp industry, petro chemical industry, fertilizer industry desalination plants, food and dairy industry, bio-medical plants and pain industry.

As far as India is concerned, the potential applications of titanium are yet to be fully explored. The demand of titanium was 200 tonnes in 1989-90 which was mainly from caustic soda/chlorate industry, petro-chemical/fertilizer industry, electroplating and heat exchangers. However, by 1992-93 the demand for titanium is expected to increase to 475 and the requirement of the power sector alone would be around 150 tonnes.

The demand for titanium sponge in India is estimated at 1,000 tonnes per annum. In India this important mineral can be utilised in pulp and paper industry, bio-medical implants, dairy and food processing, off-shore drilling, cathodic protection systems and desalination plants. Titanium can also be utilised in advanced submarines and for other defence purposes because it is the only structural metal having a corrosion fatigue behaviour in salt water practically identical to that in the air. The global demand for titanium is expected to grow.

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MANUFACTURE OF TITANIUM DIOXIDE

TIDCO ties up with UK firm

After a long spell, Tamil Nadu can boast of ushering in a mega-size project with several crores of investment in the state with foreign collaboration for the manufacture of titanium dioxide. The state-owned Tamil Nadu Industrial Development Corporation (TIDCO) has succeeded in concluding technology and financial tie-up with a British company Tioxide UK. Not many in the world have technology for this product and even those having one are reluctant to share it, more so with developing countries.

Tamil Nadu's coastal belt has abundant raw material — ilmenite or rutile, the critical input for the manufacture of titanium dioxide. The TIDCO project costing nearly Rs. 350 crore, got 'SIA' registration only in July 1990 though it was one among at least 14 other holding LIs, for the project. Both the 'TIDCO' and the UK partners have already identified the coastal town of Kudiraimoni for the project. Experts from the UK company okayed the site after inspection.

In fact they carried the sample raw materials for lab-test and found the properties suitable for the proposed project. Titanium dioxide is a basic inorganic pigment which is available in two forms — anatase grade and rutile grade. This pigment is capable of imparting colour to a medium and its physical and chemical properties eminently suit the painting and printing ink industry.

The paint industry is however the largest user of this material where this is used as an opacifier forming the base material for paints and as a pigment in white or light coloured paints. It is also used in the manufacture of plastics, rubber goods, tyres, paper, synthetic fibres, vitreous enamels and pottery glaze, according to experts. At present, there are three units engaged in the field. They are: Kerala Minerals and Metals Limited (KMML), Travancore Titanium Products Limited and Kolmak Chemicals Limited (West Bengal) with a combined installed capacity of 38,350 tpa manufacturing both rutile and anatase grades.

The total production in the country in 1989-90 was around 23,000 tonnes against the demand of nearly double that quantity. Substantial amount of titanium dioxide is imported. Both the Kerala companies are reportedly not doing well due to what the experts say are technical and financial problems. At one time, there were reports that Tatas, whose group company TOMCO have licence for 50,000 tpa, might be interested in acquiring the two units. Later the move seem to have been dropped. Sources indicated that Tatas are keen on entering Tamil Nadu for this project, though their plan, besides acquiring the Kerala plants, was to set up a 100 per cent 'EOU' in Ratnagiri. The 'TIDCO-UK' partners have not yet identified the Indian partner, if any, though besides Tatas, others are also reported to be interested.

The present financial understanding between the TIDCO and the collaborators is that TIDCO will contribute 26 per cent equity, Tioxide, UK 25 per cent and the balance by the partner. A few days back two officials — M/s. John Dean and Job Toorey from the group planning division of the UK company came to Madras to have detailed discussions both on technical and financial aspects of the project.

It is believed that they had invited senior technocrats of TIDCO to visit Europe to have on-the-spot study of the technology at work (supplied by the Tioxide of UK), particularly with regard to effluent management systems — an area which is considered very important in this field, involving considerable investment. According to sources though right now, there is a dip in world demand, it is likely to pick soon. Both TIDCO and the UK company are having their eye on export possibilities also — at least 20 to 25% the output.

Demand for titanium dioxide is likely to increase to 70,000 to 72,000 in 1995 and further to 110,000 to 115,000 tonnes in 2000 AD. Thus there is assured market for the TIDCO project. The total availability of raw material according to experts is nearly 38 million tonnes both ilmenite and rutile. During their recent visit to Madras, the collaborators had indicated that they will be able to depute their experts sometime in middle of 1991 for further discussions. At present, the company's infrastructure — both men and material — is depleted in Malaysia where a similar project is being set up. This project is scheduled to go on stream in the middle of 1995. Meanwhile the TIDCO is moving the matter with the Centre for environmental clearance. Along with this, it has urged the Tamil Nadu Water Development Board to carry out a detailed study and investigate water availability sources of yields in the area. The project may need upto four MGD of water.

INDUSTRIAL PRODUCTION UP 10.5%

Several states and union territories registered significant growth in the number of enterprises and the number of persons employed over the last decade according to the provisional results of the 1990 economic census released in New Delhi on November 22. The results were released by the Central Statistical Organisation (CSO) with respect to 14 states and three union territories where field work was completed by August. The highest growth was recorded by Chandigarh, where the number of enterprises rose to 33,000, registering a growth of 109.8% since 1980, when the last census was conducted. The number of persons employed went up to 2.0 lakhs — 67.8% growth.

rkshop on waste technology, pollution begins

great engineering projects of the entury will not be the civil engine- of dams or bridges but the bio- eering of sewage works and waste The star scientists will be those ind cheaper ways to dispose plas- r to clean contaminated soil.

is was the message of the five- ternational workshop on Pollution ntion and low waste technology, ised by the National Productivity cil and the .CDG of Germany, n began at New Dehlhi on Nov.19.

augurating the workshop, environ- secretary Mahesh Prasad said that r-sighted companies, the environ- may turn out to be the biggest rtunity of enterprise and invention he industrial world has seen so far. ime, he said, to move away from p-of-the-pipe' approach to cleaner nologies which produce low or no e at all.

may often mean rethinking and signing industrial processes to cut se of hazardous raw materials. By mising pollution, a company may reduce the environmental risk it . "Redesigning of industrial pro- es can be in the form of reforma- equipment redesign process ification and resource recovery.

he most important pay-off from low e technologies would be creation of growth opportunities for the indus- s well as the national economy in orm of new markets for recovered rials, processes", he said.

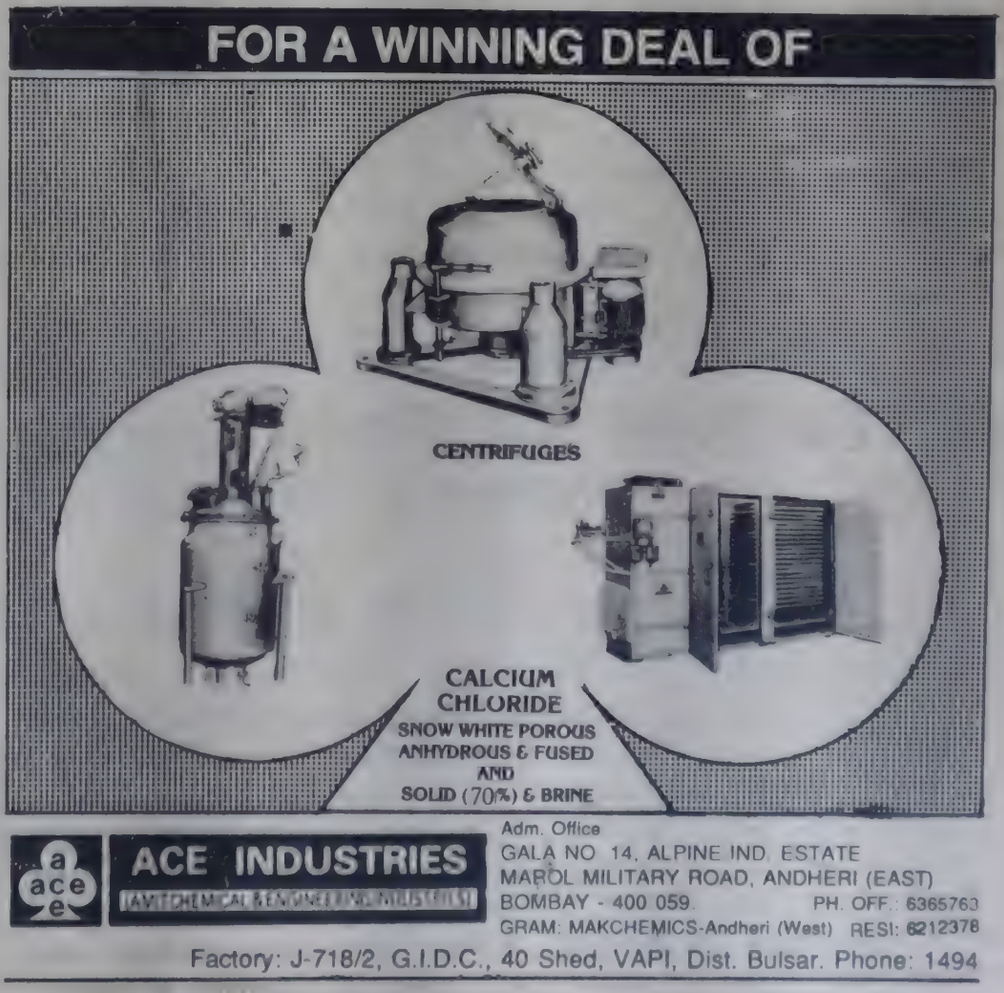
One of the major factors that dis- ages entrepreneurs from adopting technologies is the perceived finan- risk associated with relatively new n technologies", said Mr. Prasad. aid it was high time a combination formational and institutional mea- as were devised to promote pollu- tion prevention through cleaner technologies. The secretary also said that the setting up of the National Waste Management Council by the ministry of environment and forests was a step in the right direction. The Council will explore and identify alternatives for a low and no waste approach in various industrial sectors. About fifty leading experts from Indonesia, Malyasia, Philippines, Thailand and India are participating in the workshop.

'CHEMICAL ZONE' AT THANE COURT FAVOURS FLAT BUYERS

The flat-buyers awaiting possession of their newly constructed flats in the "chemical zone" at Thane have heaved a sigh of relief with the high-court judgement going in their favour. This waves green signal to the on-going and new projects in this zone — permissions to which were held in abeyance by the Thane Municipal Corporation (TMC) in January 90.

The decision of TMC to stop the construction of housing complexes in the "chemical zone" was sequel to a representation made by several chemical companies from Balkum, Kolshet, Chitalsar-Manpada and Majiwade to the Maharashtra government that housing construction within a radius of one km from their factories should be stopped forthwith (ET, Jan. 23, 90). This was to avoid danger to human life in the event of any major mishap.

Shocked as they were by this decision, architects, builders, contractors and people who had booked flats and also had part-paid, made several representation to the concerned authorities. With a slight change in the order i.e. reducing the distance from one km to 500 m, the TMC gave an informal nod to carry on the ongoing constructions.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Reliefs for fly-ash brick units mooted

The central committee on pollution management has recommended to the Government a series of concessions for plants making fly-ash bricks in India.

Mr. S.T. Narayanaswamy, chief engineer, National Research Development Corporation (NRDC) said recently at Calcutta that fly-ash bricks had extremely good potential for development in areas where conventional bricks were costly, as in West Bengal.

On an average, conventional bricks cost Rs. 1,400 per thousand as opposed to fly-ash bricks, which were available at Rs. 850 per thousand.

The waste management group of the committee had recommended, among other things, total exemption of such bricks from sales tax, provision of part of land near power station for brick units to reduce transport cost and provision of free electricity. The only concession granted to fly-ash brick units so far was the exemption of excise duty.

Mr. Narayanaswamy said that in places like Delhi, the conventional bricks were priced at around Rs. 900 but the fly-ash bricks would soon be available at Rs. 700, thereby making them cheaper all over.

The Council for Scientific and Industrial Research (CSIR) had developed a type of fly-ash brick, which had over 80 per cent fly-ash content.

The fly-ash waste, which was left by power stations were harmful pollutants and the brickmaking efforts could be a viable way of disposing the residue, he said.

Apart from the pollution factor, the disposal costs for fly-ash incurred by power stations amounted to about Rs. 50 per tonne. The waste was currently being dumped into agricultural land, which had an adverse effect on their quality.

For a long time, the lone plant was located in Barrackpore on the outskirts of Calcutta. New fly-ash plants are now coming up at Raichur in Karnataka and Bandel in West Bengal. The Bandel plant had a capacity of one lakh bricks per day and both the units were expected to be commissioned by the end of the year.

At a seminar on fly-ash bricks organised by CSIR, NRDC and the Central Fuel Research Institute (CFRI), recently at Calcutta Mr. Prabir Sengupta, West Bengal Power Minister said that the time had now come for a plunge into the commercial utilisation of fly-ash bricks instead of mere theoretical exercises on the subject.

He called upon all scientists, architects, builders and entrepreneurs besides government housing organisations to explore the possibilities of fly-ash brick production and marketing.

Mr. T.C. Dutt, State Chief Secretary said the technology could be used for the socio-economic uplift of the people of West Bengal and other states.

He said suitable fiscal and economic measures needed to be thrashed out to provide a boost to the innovative technology. Lauding the efforts of CFRI which had built the prototype satellite township at Asansol with fly-ash bricks in collaboration with the West Bengal Housing Board (WBHB), he said the State Government would consider relaxing some of the bottlenecks to the growth of the industry.

Apart from easing pollution through fly-ash, such units produced bricks which were stronger and lighter than conventional bricks. They were free from any adverse effect during saline conditions.

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ONSUMER PRODUCTS

Environmental labelling likely

Positive environmental labelling on onsumer products, (somewhat similar ISI marks), in vogue in some of the estern nations, is being actively conidered at the government level.

The ministry of environment is elieved to be of the view that such abelling could help to inform consumer hoice, to improve the environmental mpact of products and to strengthen the ompetitive position of the Indian prolucts. Since it has potential benefits for ll, the ministry intends to actively ursue the development of an appropriate scheme.

The main question, however, is whether the basis for the scheme should e voluntary or otherwise. The products which have the least impact on the environment and health could be given a mark — as for instance the ISI mark —or a symbol or logo. This is broadly defined as the labelling of product for environment friendliness.

The FICCI is also seized of the issue and it has taken an active role along with the ministry. According to sources, a labelling scheme would authorise those companies producing goods which meet certain performance and criteria to label these as environmental friendly, with a recognised symbol.

It is being argued that if these goods enjoyed an increased market share through the positive choices made by consumers, there would be an incentive for more companies to change their process and/or products to meet the criteria.

The labelling scheme could also be a means to help reduce environmental problems by providing people with information to make wise decisions while selecting a product and by encouraging companies to reduce the environmental impact of the products. Labelling of products is in operation in many countries of the west. It is in existence in West Germany (since united) since 1978 and a blue angel label (the symbol of UN environment programme) is awarded to those products meeting the established environmental criteria.

More recently, Japan, Canada and UK have established schemes and other European countries like Norway, Sweden, France and the Netherlands are currently at various stages of developing these labels. There is also a proposal for an EEC-wide labelling scheme.

Despite many positive points in favour of such labelling, it might pose problems of scope, operation, organisation and funding. But the ministry appears to be keen on introduction of the scheme. Industry sources have defined environment friendly products on which such labelling could be introduced as: those which do not cause harm or damage to man and his environment during their production or use and which (including its constituents) also do not pollute the environment on their disposal or generate such products.

For instance, a car polluting the air with thick exhaust fumes is not an environment friendly product and so also, paper which depletes natural resources like wood from forests.

The outgoing ministry had identified atleast 17 consumer products for priority consideration for labelling but before feedback could come from the organisations concerned, the ministry fell. The ministry is stated to be of the view that it should be voluntary. The list of products tentatively considered are plastics, soaps and detergents, aerosols, paper, pesticides, fertilisers, textiles, drugs, cosmetics, electrical goods/electronic goods, paints, rubber, preservatives and food additives, batteries, beverages, packaging and lubricating oils.

The ministry is also of the view that labels should be awarded for a minimum period of three years. Bureau of Indian Standards shall administer and implement the scheme with the ministry popularising it and that the scheme should be self-financing.

PROTECT ENVIRONMENT, STRESSES NATURALIST

The general secretary of the International Society of Naturalists, Dr. G.M. Oza, has stressed the need for protection of environment. Speaking at a three-day seminar on 'environment management' organised by the Oil and Natural Gas Commission recently at Baroda, Dr. Oza said 1990 would be the most decisive decade in human history. In contrast to the dwindling wildlife species, the number of human beings were ever increasing, he said. "We have already passed the 5,000 million-mark placing ever increasing demands on the earth's natural systems and finite resources", he added.

About 800 million people on the planet were living in absolute poverty deprived of the basic human necessities, he said. Referring to the wilful extinction of animal or plant species by men, Dr. Oza said "Wild life is not ours to dispose of as we please. We have it in trust and must account for it for the future generation."

The already existing master plan for global conservation should be implemented effectively for environment protection and conservation, he said. Dr. Oza suggested some alternatives for the survival of animals, man and plants, including taking active steps to encourage more efficient public transport, developing an integrated public transport policy and educating the youth about the importance of conservation. He also suggested that help be extended to those who are working towards restoration of degraded land and ensuring that afforesation programmes leave some room for wildlife.

FINANCING INDUSTRIAL PROJECTS

Environment friendliness to be main criterion

Financial institutions will consider environment friendliness as a criterion while assessing requests for financial support for industrial projects. This is stipulated in the draft policy statement for abatement of pollution prepared by the ministry of environment. It will be implemented after considering the industry's views.

The new policy would also require applications for consents to operate permits and licences under the relevant rules and acts inforce, to provide an environment management plan identifying pollution prevention options, including options for minimising the discharge of industrial wastes to sewers.

Further, environmental auditing will be introduced in companies, statutory authorities and local bodies to evaluate the effect of their policies, operations, and activities on the environment. While assessing pollution prevention options, government will consider (in order of preference) reduction at source, recycling, treatment and waste disposal.

The focus of the policy is on processes which generate waste, not on end-of-pipe discharge and emission controls. Standards will be set for waste minimisation processes, not for emission and effluent levels.

The government has listed some priority wastes, which include the compounds of arsenic, cadmium, chromium, copper, lead, nickel and tin; vinyl chloride monomer, benzene, chlorinated hydrocarbons.

Ozone depleting substances, photochemical organic substances, polycyclic aromated hydrocarbons, and polychlorinated and polybrominated phenyls or related substances or equipment.

Support for initiatives for recycling of waste will be given through the procurement policies of the government. In addition, small units, particularly those in rural areas, will be given subsidies to aid implementation of pollution standards.

This will be achieved by promoting collective action by small units and technological upgradation. Government will use fiscal instruments to encourage a shift from curative to preventive measures, internalise costs of pollution and conserve resources, especially water.

The present administrative charge, or water cess, levied to provide revenue to enforcement authorities will be replaced by an "effluent charge" based on the quantity and quality of pollutants discharged. The rate, based on treatment cost, will be set sufficiently high, as an incentive to set up treatment plants to conserve water.

Further, excise and customs rebate will be allowed to identify preventive process and monitoring equipment. Presently, the rebate is given only for pollution control equipment.

To protect environment without impairing the financial viability of industrial units, the age, size and location of units will be considered while setting the norms. Thus new units will have to conform to stricter standards.

They will need to select technologies that produce no or low quantities of wastes and recycle or reuse waste products. The policy would also require ministers, state governments, local bodies and agencies responsible for planning and implementation of development projects will be required to take into account environmental aspects along with economic ones in planning.

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Untreated well water dangerous

rinking water supply from wells aminated by groundwater contain- excess agro-chemicals could spell ster resulting in organic or inorganic soning of the population according Mr. Walter J. R. Buydens, an envi- mental engineer from the USA.

Potential toxic substances from essive application of agro-chemicals crops percolates to the groundwater from there to wells, warned Mr. ydens, who is also a consultant of the rld Bank's environmental policy ision, in a paper, submitted at a ent national seminar on "modern hniques of rainwater harvesting, ter conservation and artificial harge for drinking water, afforesta- n, horticulture and agriculture", at ne.

"Using such untreated well water for nking could lead to cancerous disea- and other illnesses which affect the central nervous system". Moreover, the "treacherous" presence of pesticides in groundwater is compounded by the fact that the adverse affects of health manifest themselves very slowly", he said.

Mr. Buydens said, due to slow movement of groundwater flow, pesticides emerge only after a few years although by then the concentration might have accumulated over a period of time depending on the rate of biodegradation.

Analysing that the adverse effects of the use of agro-chemicals would not be immediately obvious to the farmer who chiefly depends on short term economic benefits, Mr. Buydens felt that the government could adopt economic or technical steps like environmental legislation to check excessive usage of such agro-chemicals and resultant health hazards. "Either a tax can be levelled on the purchase price of herbicide or a direct environmental tax, commensurate with level of groundwater pollution can be imposed", he suggested as an economic measure.

Artificial recharge techniques, aimed at diluting concentrations of chemicals present in the groundwater, could be an example of a technical measure, he added.

INDIA TO ATTEND GLOBAL OCEAN WARMING STUDY

Indian oceanographers are likely to participate in a unique international experiment to determine whether the earth is really getting hotter because of the greenhouse effect.

The 10-day experiment, to be conducted from "Heard Island" in the southern Indian Ocean during January 1991, will involve sending pulses of sound through the oceans to estimate ocean warming on a global scale.

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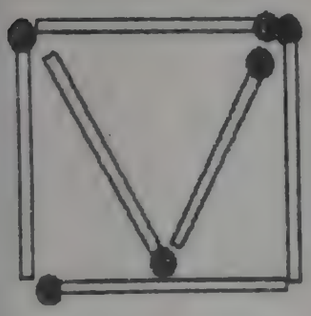

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Poor ranking for Indian cities

None of the cities in India, including Delhi, Bombay, Calcutta and Madras, can be classified as "livable cities" by any standards, says a study by the Population Crisis Committee. Astronomical population growth, environmental pollution, traffic congestion, cramped living space, inadequate sewage, and housing shortage have combined to push Indian cities to the lowest rung of the "world's 100 most livable cities".

The study "Cities: Life in the World's 100 Largest Metropolitan Areas", ranks 100 cities spread over 45 countries, including India, and was commissioned by the Population Crisis Committee (FCC), a non-profit organisation advocating population stabilisation through universal voluntary family planning.

Overcrowded Indian cities, unable to keep pace with the need for more transportation, sanitation, schools and hospitals, failed miserably in the test applied by the study to determine "good living standards of a city".

The study used ten indicators to determine this. They were: crime rate, food expenditure, living space, access to utilities, communications, education, infant mortality, air quality, noise pollution and traffic congestion. While the five most livable metropolitan cities were Melbourne (Australia) Montreal (Canada) Seattle-Tacoma and Atlanta (USA), and Essen-Dortmun-Duisburg (West Germany), congested Kanpur, with its tanneries posing a health hazard, won the dubious distinction of being the most polluted city.

Senior vice president of the PCC Sharon L. Camp told a press conference at Washington that the study was not "a guide to the best vacation spots or a good place to retire, but to emphasise the enormous impact of population growth on the infrastructure of a city Dr. Camp called for urgent internatio efforts to help curb population grow rate in developing countries. The Uni States should double the amount of f eign assistance for population pr grammes in the Third World. It shou also start contributing to the Unit Nations population fund, she added

More than half of the world's 1 largest cities are faced with a popu tion growth that threatens their infr structures, already bursting at the sean "Living conditions have collaps under the weight of numbers". T study demonstrates clearly that developing countries, curbing over population growth will have a signi cant and positive impact on the futu quality of urban life", she adde According to the study, the populati in most of the cities in the developi countries like India and Pakistan, wou double in another 12 years. People these cities are already spending 58 60 per cent of their income on food, per cent on shelter, and more than ha the houses in these cities have no re ular water or electricity supply.

Two-thirds of the children in the cities are not in schools and there is on one telephone for a hundred peop while there are 150 phones for 1 people in the United States.

Although urban violence or stre crimes are almost absent in Indian citi when compared with the high crim prone Manila or Mexico City, "Del has a serious air pollution proble which is a health hazard", the stud said.

The committee makes an interestin suggestion that if you want to live India, in comparative comfort, yo should move to the South. Madra Hyderabad, and Bangalore, are better in providing education, transpo tation, health care, food, sanitation ar "quiet" to their residents than Delh Bombay, Calcutta, Pune or Kanpur.

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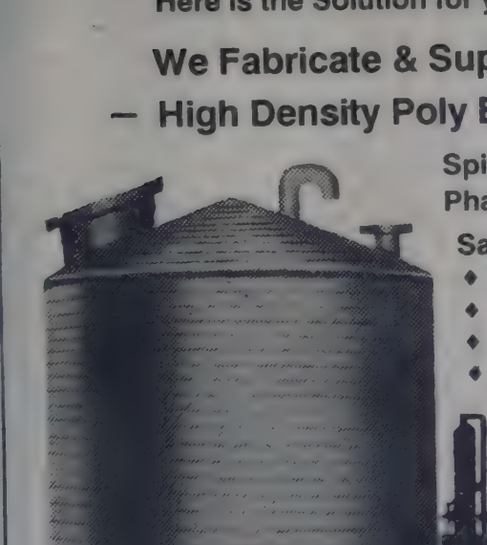

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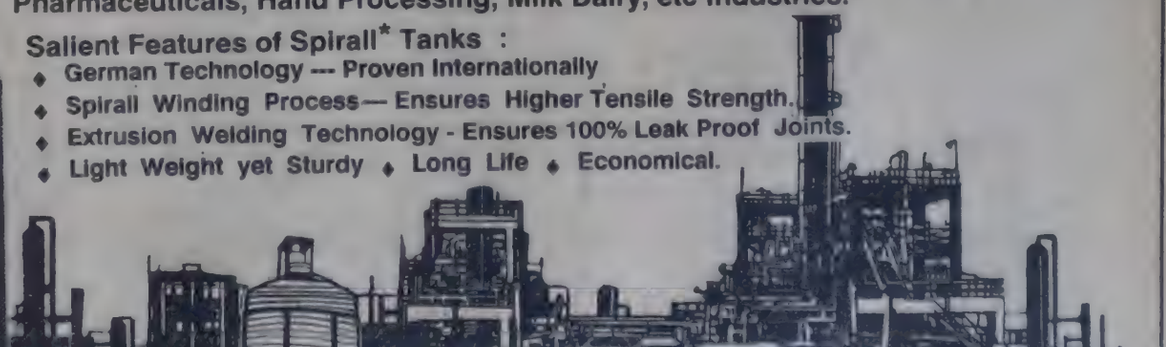

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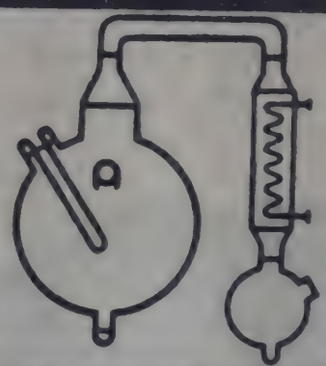

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Highlights in Chemical Technology (Part 1)

CROWAVE IRRADIATION LIED TO CHEMICAL TECH-LOGY — A CONTINUOUS W PROCESS USING CROWAVE IRRADIATION VELOPED

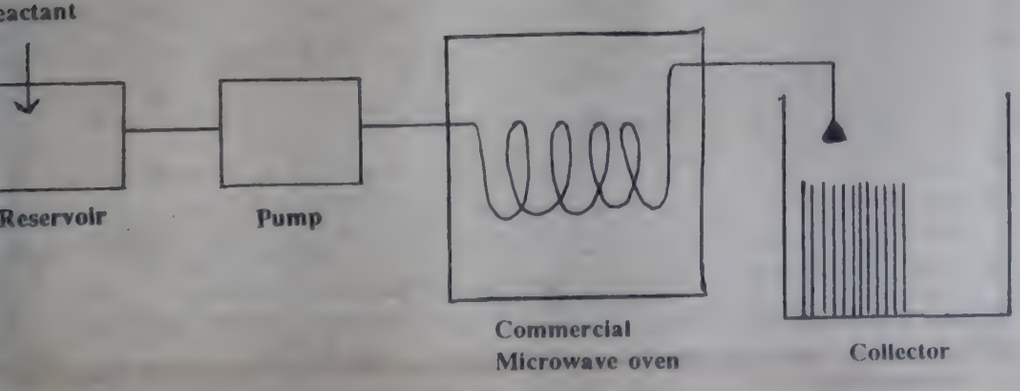
Microwave ovens have been explo- for moisture analysis (Anal Chem. 4, **46,** 1160), organic synthesis (e.g. Chem Soc, Chem Commun, 1989,), acid decomposition of botanical biological samples (Anal. Chem, 6, 58, 2534) and rapid hydrolysis of tides and proteins (J. Chromatogr, med. Applications, 1989, **491,** 424). rapid heating capacity of the rowave oven leads to a considerable ing in dissolution of reaction time. wever, the inherent hazard of violent losion due to the high pressure and perature developed in a closed sel under microwave irradiation, has ited the scale at which these rapid crowave reactions have been carried

The feasibility of applying micro-ve technology to large scale organic nthesis has been under active study by emical technologists and researchers advanced countries, particularly in estern Europe, and North America. any hope for a new revolution in emical technology with the applica-n of microwave irradiation. Recently searchers S.T. Chen, S. Chiou and K. ang in Britain employed microwave chnology to large scale organic syn-esis. (J. Chem Soc, Chem Commun, 1990 807). Employing a new continuous procedure, shown schematically in Fig. 1, the feasibility of applying microwave technology to large scale organic synthesis for industrial use has been demonstrated for 5 different types of reactions:

(a) Esterification of p-hydroxy benzoic acid with butan-1-ol and methane;
(b) The racemisation of optically pure amino acids in acetic acid,
(c) The S_N^2reaction phenoxide with benzyl chloride,
(d) The acid hydrolysis of sucrose to glucose and fructose;
(e) The cyclisation of butane-1, 4-diol and of diethylene glycol.

The reactants in the reservoir are pumped into a microwave-transparent Teflon reaction coil (total volume 10 ml) in a standard kitchen microwave oven (2450 MHZ, 650 W, with 10 adjustable power settings) and then out to the product collector. All of the reactions tested had a higher conversion efficiency compared with those conducted in a closed vessel system within the same period of irradiation.

This study now highlights several points of commercial interest: the potential reaction hazard of closed vessel microwave heating can be avoided by using a continuous flow process; the use of iron exchange resins as catalysts for the conversion of sucrose to glucose and fructose under microwave irradiation should be able to compete with the industrial operation currently achieved by immobilised enzyme processes; and continuous flow microwave irradiation is an inexpensive process for the conversion of unwanted optical enantiomers into racemic mixtures for further enrichment and recovery of useful enrichment and recovery of useful enantromers.(*S.T.Chen, S. Chion and K.T. Wang. J.Chem Soc, Chem Commun.* 1990, 507) *Chem & Ind.* 10/3/90, p. 549).



CERAMIC FAR INFRA-RED RADIATION HEATERS DEVELOPED BY ASAHI GLASS

Asahi Glass Co. of Japan has recently developed and marketed honeycomb type far infra-red radiation ceramic heaters, which produce heat when an electric current is passed through them.

They are suitable for the production of a large amount of hot water and for the generation of hot air. It is possible to shape them into any form in accordance with the volume of hot water and hot air. When loaded with platinum, they are usable as decodorizing catalysts. The company has hitherto commercialized cylindrical/flat type far-infra-red radiation ceramic heaters, which have been used as parts for copiers, printers, hair driers for permanent waves and applied to drying of printed films and screens. (*Japan Chem Wk.*, 7/5/90, p. 5).

HIGH-ACTIVITY POROUS SILICA PRODUCED FROM HYBRID POLYMER

Researchers at the Faculty of Engineering (Kyoto Univ., Japan) have recently synthesized organic inorganic hybrid polymer (called hybrid silica polymer) through co-hydrolysis of tetraethoxysilane (TEOS) and polyoxazoline incorporating a tri-ethoxysilyl group at its terminal. It is possible, according to researchers to control the degree of oxa-

zoline polymerization and introduce afunctional group into the polyoxazoline terminal. The research group has produced polyoxazoline by suspending oxazoline polymerization using 3-aminopropyl triethoxysilane. It has dissolved the resultant product and TEOS in ethanol, dropped hydrochloric acid solution therein and left them at room temperature. Colourless transparent and glass-like hybrid polymer was then produced. The research group also successfully produced similar hybrid polymer from poly-oxazoline incorporating no triethoxysilyl group. It has thus confirmed that it is possible to produce hybrid polymer from silica gel and organic polymer including an amide bonding which actively reacts with silica.

The hybrid polymer was changed into porous silica (pore capacity 0.5cc/gm) after being pulverized and treated at 600°C for 24 hours. The porous silica's surface area stands at 800 m^2/gm nearly equivalent to that of active carbon. The organic component of the hybrid polymer was burnt away in the heating process. The new process employed by the research group is regarded as a promising synthesis method for high activity porous silica.

In the conventional process, porous silica is produced through hydrolysis of silicon tetrachloride within an oxygen/-hydrogen flame. The particle size concerned is smaller than that of porous silica produced using the above new process. (*Japan Chem Wk.*, 7/5/90, pp. 5,8).

A LOW-IMPACT NITROGEN FERTILIZER ON THE HORIZON

European regulatory agencies are discouraging the use of large quantities of nitrogen-based fertilizers because it is said that they release chemicals faster than plants can take them up, and the excess nitrogen poses on ecological liability. Therefore, there is a great need for slow release nitrogen fertilizers. Looking to this pressing need, Haifa Chemicals (Haifa, Israel), the world's leading producer of potassium nitrate, is developing a fertilizer that will release nitrogen more slowly than current compounds do.

This breakthrough is a new landmark in the field of nitrogenous fertilisers — making them environmentally friendly. (*Chem Wk.*, 9/5/90, p. 32).

CARBON ADSORPTION-CUM-MEMBRANE FILTRATION TECHNOLOGY BOOSTS BIODEGRADABILITY

A unique combination of activated carbon adsorption and membrane filtration is being used to step-up the biodegradability of waste water leaving the Sandoz complex at Muttens, Switzerland.

A new pretreatment plant built by Uhde has just come onstream to deal with the waste from the Muttens complex, which produces chemicals for the paper and textile industries as well as agrochemicals. The facility can deal with all the waste from four large production units, corresponding to about 2600 m^3/day on a 5-day basis.

The plant uses an activated carbon adsorption process developed by Udhe in combination with Sandoz own membrane filtration process. Smaller molecules are adsorbed by the activated carbon, while larger ones are separated by membrane filtration. Dr. Pierre Meyer, assistant vice president of dyestuff production at the Muttens complex reported 'When the two processes work in parallel, they are synergistically to increase the biodegradability of waste water from about 65% to the statutory value of 85%.

Meyer believes this is the first time anyone has used the two processes in parallel. The company (Sandoz) will consider using it in other plants if its first year of operation is successful. The technology is expensive, however, ar Meyer estimates that the cost of mo efficient waste treatment will be 5-10% increase in product prices.

The activated carbon is regenerate in two steps. First, the carbon is washe to remove salt and dried in a double be oven at 600°C. Second, the carbon roasted at around 850°C in a limite amount of air. The plant designer looked at the increase in biodegradab lity achieved using peroxide treatmer with adsorption on activated carbon, bu found that this procedure was not a effective. (*ECN*, 9/10/90, p. 31).

MONTEDISON PLANS COLLABORATIVE R & D FOR PRODUCTION OF OLEFINS FROM NATURAL GAS (METHANE TO PROPYLENE ROUTE)

Montedison (Italy) has recently signed a collaboration agreement with German engineering contractor Lurgi and catalyst specialist Sud-Chemie to develop a new process for the production of olefins from natural gas. The process is being optimised for the production of propylene as part of moves to secure an independent feedstock supply for the polypropylene operations of group company Himont.

The process, the culmination of two years research effort, is based on a new zeolite-based catalyst supplied by Sud-Chemie. The companies declined to give further details, but Montedison reports results obtained on a small pilot unit at Lurgi's Frankfurt base are very positive. The companies expect to begin building a semi commercial plant at Montedison's research centre in Porto Marghera, near Venice by the end of 1990.

Prompted by the light propylene market and resulting high prices, Montedison has been keen to break PP's dependance on the naphtha cycle for some years. With access to large natural gas reserves, it is

ss is even more attractive in light current energy situation. Monte- through Himont, is also exploring us propane dehydrogenation tech- gies. Direct oxidative coupling of ane to produce ethylene and higher ns such as propylene has been pro- d for a number of years.

eparately, Montedison and Lurgi also signed an agreement to elop new technologies for treating n and industrial wastes. Orion, ntedison's newly focussed research idiary, will be responsible for iden- ng specific waste problems. (*ECN* 6/90, *ECN* 9/17/90, p. 52).

PERCOMPUTERS & COM- TER GENERATED GRAPHICS ED BY ENGINEERS TO DERSTAND NEW COMPOSITE TERIALS

Supercomputers and computer gen- ted graphics are now used by engine- at the National Institute of Standard Technology (NIST) USA to try to ter understand how new composite oxy stand up under stress and strain.

With mathematical modeling techni- es, NIST is able to simulate and view stress wave moving through a piece graphite epoxy. NIST is focussing on aphite epoxy because it is coming into despread use in aerospace and fense industries. The epoxy used tensively on the stealth bomber and bmarine hulls, has the ability to sorb radar and sound waves. (*ASTM andardization News*, 7/1990, p. 12).

OURTAULDS UNVEILS CRYLIC FIBRES WITH BUILT- N BACTERICIDE

A new acrylic fibre which can pre- ent the build-up of hazardous bacteria cloth furnishings and medical equip- ent has been developed by Courtaulds esearchers and Courtaulds Fibres & erformance Products. Trade named ourtak M, the new fibre is expected to be particularly useful in the medical and food processing sectors.

The fibre contains a combination of two metallic salts, one of which is active against bacteria and the other against fungi. These are bound into the fibre matrix and are therefore, not removed by washing. This gives a key advantage over superficially applied anti microbial products, according to Courtaulds.

It is envisaged that Courtek-M will be used in combination with other fibres, such as cotton to produce clothing. It may also be used in filters for air-conditioning systems. (*ECN*, 7/9/90, p. 20).

RADIOLUMINESCENT LIGHTS BASED ON ORGANIC POLYMERS ON THE HORIZON

Production of all organic, optically clear, solid matrix, radio luminescent lights has been achieved by organic chemicals at Sandia National Laboratories. Such lights may prove more robust than those based on glass tubes, filled with tritium gas. Expected uses include non-electric landing lights at remote airfields and 'Exit' signs on planes and ships.

Sandia researchers catalytically tritiated 1, 4 bis (phenylethyl) benzene. They made 20% solutions of the tritiated compound in styrene, added fluorescent dyes and poured solutions into molds. Radioactive decay initiated polymerization, with gelation after one week and setting to hard solids after two weeks.

Thereafter beta decay stimulated π–π^* transtitions in benzene rings of polystyrene. Ultra-violet emissions from relaxation of these excited states produced fluorescence from the added dyes. The Sandia chemists used a mixture of 9, 10-diphenylanthracene (DPA) and 2-phenyl-5-(4-biphenylyl)-1, 3, 4-oxadizole (PBD) as dyes to make blue dyes. For orange lights they used a mixture of DPA, PBD, 3-hydroxy flavone and rubrene.

Because penetration of beta particles from tritium decay is less than 10μ in solids, researchers say, there is no danger of escape from the matrix. However, one drawback is that light output from the devices decreases by 50% after one month owing to radiation damage to the matrix, which turns brown. Further work is in progress at Sandia for developing more radiation stable polymers and dyes. (*C & EN*, 9/10/90, pp. 23-24).

TOXIC WASTE PROCESS EMPLOYS SILVER

A new process to eliminate toxic wastes is being piloted at AEA technology, Dountrey, Scotland (UK). It involves use of a typical modern electrolysis cell and employs divalent silver, one of the strongest oxidants known, with nitric acid. The oxidative property of silver in the acid causes the generation of very highly reactive radicals, such as hydroxyls, which rapidly oxidize organic compounds into water, carbon dioxide and carbon monoxide.

The divalent silver is generated from its monovalent state at the cell electrode, and spent silver is recycled to the electrode for recharging back to its divalent state. The process, developed by AEA technology to destroy toxic chemicals associated with combustible radioactive waste was found by the company on further study to completely destroy such troublesome compounds as phenols, chlorinated phenols, chlorinated aliphatic and aromatic solvents, polychlorinated bi-phenyls and organo-phosphorus and organo-sulfur compounds. (*C & EN*, 9/17/90, p. 20).

BRAZIL DEVELOPES A NEW MODIFIED HYDRAZINE TECHNOLOGY

Brazils Aerospace Research Institute

hopes to complete development of technology to produce hydrazine hydrate and hydrazine rocket propellant within the coming 12 months. Institute, INPE (located at San-Jose des Campus) is seeking local or overseas partners for short term industrial production. It aims to set up a 2000 kg/month of hydrazine hydrate and 100 kg/month of propellant plant respectively.

The Brazilian company Ibrasol, and Solvay's subsidiary, Peroxidis do Brazil, are understood to have shown interest in the project which will cost around $ 1 million. A substantial return is expected through trading with developing countries.

Production will be based on a modified version of the French PCUK process. This involves the chemical oxidation of ammonia by hydrogen peroxide. The INPE plans to apply for a process patent and commercialize the new routes. (*ECN*, 9/24/90, p. 26).

BAYER UNVEILS A PROCESS FOR RECYCLING CROSS-LINKED POLYURETHANES

Bayer (Leverkusen, W. Germany) has recently developed a process for recycling cross-linked polyurethanes, which can be used to recycle damaged moulded parts from automobiles as well as for processing production scraps. The parts are granulated and pressed at a temperature of 180°C and high pressure. Bayer describes the process in which granules flow together to become plastic, as a cross between melting and sintering.

Bayer reports that the new parts moulded from the recycled plastic possess around 50% of the tensile strength of the original part, making them suitable for use as casing for automobile batteries as well as for coverings for exterior automobile parts. Bayer researchers are now working on improving the quality of the recycled material. (*ECN*, 9/24/90, p. 26).

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Science Briefs

ERAMIC ENGINES FOR ATELLITES

In its efforts to create a new generation of small high-performance bipropellant engines, the European Space Agency is developing ceramic matrix composite materials. The main advantage of these composites is to allow a maximum combustion temperature to be increased to 1,600 degrees celsius, without requiring anti-oxidation coatings, and with improved resistance to thermal cycles.

The small bipropellant engines currently on the market all use metallic combustion chambers, which are more or less refractory according to their type of cooling used. A motor using regnerative cooling may very well be made on stainless steel, but radiation-cooled engines require higher-performance materials.

The main goals of the ceramic development programme were: to produce single-unit parts comprising the combustion chamber and a nozzle with a large expansion ratio; to study coupling and sealing techniques between the metallic injector and the composite chamber; to define the thermal barriers which would enable the injector temperature to be limited, both under continuous operation, and especially during pulsed mode when the propellants stop circulating.

The various tests provided proof that *cerasep*, the ceramic composite material, was indeed the material best adopted to the programme objectives. Five major operational targets were met, each one on a single specimen, with no significant erosion ever observed.

-- P.T.I. Science Service, Oct. 1-15, 1990, p. 17.

FOOD-BAIT TO TRAP UZIFLIES

Scientists at the Indian Institute of Chemical Technology in Hyderabad have developed a food-attractant to be used as a bait to lure and trap uziflies, a serious pest that feeds on the silkworm. The agar-based food attractant contains jaggery, maltose, citral, vanillin and a weak formaldehyde, scientists from the biology division of the IICT said, reporting their findings in the journal *Current Science*.

The entry of the alien uzifly in India a few decades ago has been of great concern to scientists who say that if the fly spreads in the country, it could harm the silk industry. Agar-based food attractants were formulated using jaggery because jaggery and agar powder heated in water and cooled and set in petrydishes attracted uziflies.

In the IICT study, diet-based formulations have been used for the first time to evaluate them as a control strategy for uzifly infestations. The IICT team screened several natural and synthetic chemical compounds and incorporated suitable ones in the attractant. A diet-formulation with citral caused immediate attraction and the base attractant prepared by adding two per cent vanillin in ethyl alcohol worked out as an arrestant for the flies since they could not move away from the source.

The attractiveness of the standard food attractant to both sexes of uziflies was 90 per cent, the scientists reported. Citral and vanillin are odoriferous compounds that influence the chemosensory behaviour of the uzifly and make it orient itself towards the food attractants. These volatile compounds, in minor quantities are environmentally safe and sound for non-target organisms, the scientists said.

-- P.T.I. Science Service, November 1-15, 1990, p. 1.

MANGO WASTES FOR BIOGAS-CUM-FISH PRODUCTION

A process devised at the Central Food Technology Research Institute in Mysore has paved the way for the economic use of mango wastes for the production of biogas and as a feed in fish ponds. The process involves drying mango peels thrown out by the fruit processing industry as a fuel for biogas plants. The biogas plant effluents are then used as a substitute for conventional fish-feed.

In field trials, the CFTRI team used fresh mango peels as slurry with water and charged into the biogas digester daily after an initial incubation period of 15 days. In the first eight weeks, the digester contained a mixture of cowdung and mango peel effluents until the cowdung was completely used up. After this the biogas generation was observed for another four months. The effluent was then collected and used as fish feed in experimental ponds containing two fish species — Rohu, the major Indian carp, and the common carp.

The scientists regularly poured mango peels into the ponds. They also maintained control ponds in which the fish received standard fish feed with 30 per cent protein, vitamins and minerals. Biogas effluent of mango peels when used at 34 kg per square metre of the pond area as the sole feed for the fish yielded 8.35 kg of fish every 100 square metres of the pond. The fish had acceptable colour, flavour and taste, the scientists said reporting their findings in the journal *Biological Wastes*.

Based on their experiments, the scientists have proposed a model system for the production of biogas using all wastes from a mango industry during a four-month season. In the model system, 42 hectares of fish ponds are required to use the biogas effluent of 540 tonnes, producing 34 tonnes of fish in four months.

A costing analysis based on Indian conditions for a full-scale plant suggests that the cost of fish raised on the biogas

effluent will be US$ 0.54. Present-day market rate of fish is about US$ 1.00 per kilogram. The whole system looks promising, the scientists M. Mahadevaswamy and L.V. Venkatraman said. Both species of the carp raised in the biogas effluent showed better "juiciness" and had a quality comparable to the fish that grew in the control ponds, they said.

-- P.T.I. Science Service, November 1-15, 1990, p. 1-2.

WASTE-FUELLED FURNACE FOR CROP DRYING

A furnace that uses agricultural wastes as fuel and has potential applications for mechanical drying of crops has been developed by scientists at the Tamil Nadu Agricultural University. Crop drying is an energy-intensive operation, greatly affected by fuel shortages. The increasing availability of agricultural wastes has raised the possibility of using them as substitute fuels.

The new furnace devised by a three-member team of TNAU scientists is an indirect-heating type furnace which can use sugarcane bagasse, cotton stalks or coconut shells as fuel. Describing the furnace in the journal *Biological Wastes*, the scientists said it consists of a burning chamber, a fuel chamber, two circular casings, a chimney and a centrifugal blower powered by a motor. The assembly is mounted on a frame with wheels for easy transportation.

The furnace has been tested with sugarcane bagasse as fuel with the average feed requirement of about 18 kg per hour. In tests, paddy and coconut were dried in the mechanical drier of capacity of one tonne coupled with the waste-fuelled furnace.

Moisture content in the paddy was reduced from an initial 22 per cent to 13 per cent in 10 hours at a hot air temperature of 63 degees celsius and a 33-cubic-metre-per-minute (cmpm) air flow rate. In cotton, the moisture content was brought down from 50 per cent to 10 per cent in 22 hours at 65 degrees celsius and air flow rate of 53 cmpm. The scientists expect the new furnace to cost about Rs. 15,000.

-- P.T.I. Science Service, November 1-15, 1990, p. 2.

A NOVEL SILENT NON-EXPLOSIVE DEMOLITION COMPOUND

A novel demolition compound capable of breaking rock or concrete safely without noise, vibration, flying debris and the inherent dangers in current demolition methods has been developed. This new compound, developed by scientists of the Research and Consultancy Directorate (RCD) of the Associated Cement Companies, has features which enable its use in areas where explosives cannot be used for reasons of safety of adjoining structures or in certain special applications such as granite quarrying.

Called "Acconex", controlled tricalcium aluminate (C-3A) has to be poured into holes drilled in rock or concrete and allowed to set and harden. In a few hours expansive forces reaching a level of 300 kg per square cm are generated which cause the rock to crack up. Successfully demonstrated in the excavation of the subway near Churchgate station in Bombay, Acconex's chemical reactions start immediately on mixing with water. Its effects normally manifest in 10 to 12 hours as cracks which link the holes. The cracks widen till the rocks break under stress.

It is advantageous to wait for Acconex to act fully before dislodging the pieces mechanically which takes about 24 to 48 hours after pouring the slurry, depending upon the ambient temperature, characteristics of the rock to be demolished and quantity of compound used. Generally about four kgs of the compound is needed to demolish a tonne of rock.

-- P.T.I. Science Service, November 1-15, 1990, p. 3.

NEWSPRINT FROM KENAF

Kenaf, a fast-growing non-wood plant, is emerging as a new source o newsprint paper, according to recen research at the Central Drug Researcl Institute (CDRI), Lucknow. Productio of about 40,000 tonnes of newsprin needs cultivation of 5,000 acres of lan with superior quality seeds growing u to 18 feet in 150 days, CDRI scientist say.

Kenaf, botanically known as Hibiscus cannabinus, resembles bamboo i appearance and is related to cotton an lady's finger plants. The plant can b easily cultivated in different parts o India, including Maharashtra, Oriss and Madhya Pradesh.

Kenaf is emerging as an alternat source of paper in view of the shortag of wood pulp as well as bamboo i recent times. Another non-woody alternative tried out at the Regiona Research Laboratory, Hyderabad, earlier is the water hyacinth, which ca yield fibre paper-making quality fo producing, writing paper, poster paper and invitation cards.

-- P.T.I. Science Service November 1-15, 1990, p. 3-4

STEROLS FROM WATER HYACINTH

Scientists at the Regional Research Laboratory, Jorhat, have reported th presence of sterols in water hyacinth, a nuisance water weed that is finding new use as a source of methane. A repor from the biochemistry division of RRL says water hyacinth is a richer source of stigmasterol than soyabean oil, containing nearly 0.7 per cent of the sterol which is used to develop muscles by body-builders.

The scientists collected water hyacinth plants for producing methane gas. The dried and powdered material left behind after gas generation was an

bically digested in laboratory dig-
s of about 5 litres capacity, at 31-33
ees Celsius. They found the sterol
e present in relatively smaller pro-
ions in the roots of water hyacinth
pared to other parts of the plant.
st of the sterols were present in the
state unlike other sources where
are found in a combined state.

he Jorhat researchers report that
erobic digestion for a longer time
gressively enriches the sterol con-
. The finding enhances the economic
ue of water hyacinth, an aquatic
ed which has so far been a menace
griculturists and navigators. Besides
ng a source of methane, water hyac-
yields fibre from the stems which
be used to make paper.

-- P.T.I. Science Service, November 1-15, 1990, p. 4.

AGNETIC MOLECULE SHOWS OMISE

West German researchers claim to
ve discovered an organic compound
lecule that is more magnetic than
at was previously thought, and this
uld have important applications in the
ming generation of magnetic record-
devices, reports the journal *"Sci-
ce"*. The molecule belong to a small
ss of non-metallic magnets amongst
ganic compounds that have magnetic
operties. Materials made from such
lecules may be used in futuristic
agnetic recording devices as they re-
n their magnetism even when ex-
sed to strong external magnetic fields.
is will ensure safe storage of data.

A significant feature of the new
aterial is its high magnetic suscepti-
ity. This is indicative of a quantity
at describes the magnetic effect of a
bstance when placed in an external
agnetic field. A substance may enhace
applied field, or even oppose it.
esearchers at the Stuttgart University
ade the magnet by first reacting a
mpound called 1,3,5-benzenetri-
dehyde with 2,3-dimethyl-2,3-hydr-
oxylaminobutane. The product from this reaction was oxidised with lead dioxide to give a dark powder and when this is dissolved in chloroform, a hydrocarbon solvent, an unusual blue powder formed. On examination, a magnetic susceptibility that exceeded theoretical predictions was found.

The research team hoped to determine the structure of their molecule by X-ray analysis. But they were unable to grow catalysts suitable for such analysis. Indirect methods to analyse it however proved more fruitful. It was found that the oxidation step had removed the six hydrogen atoms which were originally attached to the oxygen atoms. This would indeed leave three of the molecule's electrons unpaired.

The new molecule has three rings containing nitrogen atoms. In such an arrangement, it is not possible for both of the nitrogen-oxygen bonds to be the same. The carbon atom between them must form a double bond to one of the nitrogen atoms, and this in turn may form a dative covalent bond — in which one atom provides two electrons — with its oxygen. The other bond between carbon and nitrogen must be a single bond so the nitrogen atom has a spare electron which it cannot pair off. The researchers say the nitrogen atom will use this odd electron in its bond to oxygen.

Normally, molecules which have unpaired electrons are very reactive. But the blue compound discovered by the researchers is surprisingly stable. When its magnetic properties were subject to investigation it was found to be unlike any other material.

It was initially surmised that metal impurities had contaminated their product from the lead dioxide used in the oxidation step. But the chemists were able to rule this out by exposing the material to hydrogen chloride gas. This reduces metal impurities to their chloride salts, and so removes their magnetism. But the gas had virtually no effect on the blue compound. Even then, the researchers changed their oxidising agent to sodium periodate and still obtained the same blue magnetic molecule.

The Stuttgart University team used a technique known as electron spin resonance to investigate the new compound. They found that the three electrons in the molecule interact strongly, even though they are a long way from each other. They suspect that this interaction is the explanation for the molecule's curious behaviour. According to the researchers, the delocalised bonding system of the benzene ring is the link which allows the three electrons to cooperate, boosting the overall magnetism of the molecule.

-- P.T.I. Science Service, November 1-15, 1990, p. 11.

RED DYE FROM CARROTS

Two agricultural researchers from Israel, Mr. Ron Vunsh and Michael B. Matilsky practising tissue culture have developed a technique of producing a red dye for food beverages and cosmetics from carrots through tissue culture. In such cell cultures, plant cells are bred without growing the entire plant. The new colourant is an organic compound called anthocyanin and has several advantages over the existing food grade dyes. The deep red colour is stable under a wide variety of conditions and has no cancer causing risks generally associated with currently used artificial red dyes.

The dye is produced by isolating anthocyanin from the carrot cells and then freeze-dried into a powder. By adjusting the acidity levels of the cell culture, the product can be varied from dark red to purple to blue. The new technique is being viewed by many scientists as a more efficient alternative to conventional methods of natural dye production from vegetables.

-- P.T.I. Science Service, November 1-15, 1990, p. 12.

FRICTION POLYMERS MAY REPLACE ASBESTOS IN BRAKES

Researchers at British Petroleum in the United Kingdom have developed friction polymers that look set to end the use of asbestos in such things as brake linings, disc brake pads, clutch facings and power transmission components for both vehicles and machinery. The researchers have come up with a formulation containing a new additive and found it had other properties beyond producing catalyst supports like improved flexibility and impact resistance.

The BP chemists have confirmed that the toughened phenolic resins were good enough to enable manufacturers to make car brake shoes without having to add asbestos as a toughening agent. Asbestos had been used previously because no environmentally-safe substitute could be found to work. The result is two new resins, designated Cellobond CFP505 and CFP510, which differ in flow character and are suitable for a wide range of different processing conditions. BP says they offer increased strength and compressibility, provide comfort for drivers through good brake pedal feel, and have low noise potential.

-- P.T.I. Science Service, November 1-15, 1990, p. 12.

MONITORING SEA TEMPERATURE

An instrument that will be part of the payload of the European Remote Sensing Satellite ERS-1 will be able to measure sea surface temperature from space with an accuracy of a few tenths of a degree celsius. Officially known as an Along Track Scanning Radiometer of ATSR, the sea surface monitor is being built by a consortium led by the Rutherford Appleton Laboratory of the UN Science and Engineering Research Council. It will include contributions from France and Australia.

Scientists believe the driving force for the world's weather systems is provided by thermal, water vapour and other complex interactions between the oceans and the atmosphere. The data from ATSR will help researchers to understand these effects, and will also be useful in other studies of land, ice and cloud characteristics.

ERS-1 is due to be launched early next year. It will carry a comprehensive set of instruments scanning the Earth's surface at microwave and thermal wavelengths regardless of cloud cover and the availability of sunlight. It is planned as the first of a series of European Space Agency platforms designed to provide timely and accurate environmental data, through regular systematic coverage of all parts of the globe. The ATSR is a self-calibrating instrument of advanced design that will detect thermal emission from the Earth's surface in the infrared. It compensates for the effect of the intervening atmosphere in three ways.

Firstly, measurements are made by looking at the Earth along the satellite's tract, at an angle to the vertical, and repeated immediately afterwards by viewing directly below the satellite. This ensures that each part of the surface is viewed through two different thicknesses of atmosphere. In addition, readings are taken at a number of wavelengths in the infrared, and the differing spectral responses, both of the global surface and the atmosphere, are used to obtain additional correction for atmospheric effects.

Finally a microwave sensor provides a measure of the water vapour and liquid water concentration and so enhances the atmospheric correction. High measuring sensitivity is achieved by cooling the infrared emission detectors to liquid nitrogen temperature (around minus 200 degress celsius). The instrument accuracy is maintained by the internal calibration facility.

-- P.T.I. Science Service, November 1-15, 1990, p. 17.

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New Products

SUCCESS TO SUCCESS: N CELEBRATES ITS 22ND VERSARY

ıard to imagine, but Delrin has revolutionising metal-replace- since 1968, and demand for Du acetal resins continues to grow vide. More than ever, Delrin's ımber of applications — indeed, nost any type of mechanism or that's made — is attracting man- rers in every field. In fact, Delrin d for so many different applica- hat generalisations about its use fficult to make.

calls Mr. Richard Hollifield, Ma- turing Manager of the new Singa- Delrin plant: "The earliest uses for n were in the replacement of metal echanical parts. Manufacturers d that they could reduce costs and ove performance by using gears other mechanical parts of Delrin, ad of brass, aluminum, zinc or steel.

Today, many new applications are gned in Delrin, but there are still a l number of old ones in which in replaces metal, or other material didn't perform up to expectations. ost parts of Delrin are injection ılded, but some are machined from k shapes or extruded. The proces- g technique depends on the size and pe of the part, the quantity required other factors".

winning versatility

No one property of Delrin stands out m the others. Instead, all properties balanced so that Delrin performs ceeding well in all sorts of uses. If an ympic games were held for plastics, lrin would win the decathlon because its remarkable versatility.

Again, Mr. Hollifield said: "Delrin strong and resilient, behaving like etal in many uses. Stiffness lets parts Delrin, such as gears, work under high design loads without deformation. And resilience, or springiness, is the key to designs in which springs and spring-like parts of Delrin are moulded in place. Springiness also permits efficient snap-fit assembly in which parts "snap" past model detents so they are retained without fasteners.

"Parts of Delrin are also unaffected by moisture. They do not lose stiffness or change shape, and they do not rust or corrode. They are resistant to common solvents and chemicals, too, including hydrocarbons, and they are compatible with all neutral chemicals.

"For exteriors, Delrin parts are smooth, hard and non-porous. These smooth surfaces reflect high quality, and for interior parts, they move easily against other surfaces. And Delrin parts resist accumulating dirt or stains. "Delrin also performs well in bearing applications. Conventional Delrin is widely used in gears, cams, bearings and bushings, and special grades with even lower coefficients of friction and enhanced resistance to wear are available.

"Finally, Delrin not only outperforms metal, in many cases it can cost less, too. Because Delrin processes so well, one complex part can often be designed to replace several metal parts, thus simplifying assembly. Snap fits and welded joints in parts of Delrin eliminate fasteners and save labour, and the finishing procedures often necessary with metal are eliminated". Considering the many advantages Delrin offers manufacturers, it's obvious why its scope of applications range from small-to-medium component parts to large scale housings and structural parts. It is also obvious that Delrin's success in the market will continue to be celebrated for at least the next 22 years.

Watertec taps into new markets

Three years of hard work finally paid off for Watertec Malaysia Sdn Bhd with the recent introduction of the first plastic water taps to be manufactured in Malaysia. Watertec set out to develop a new line of plastic water taps that would give better durability and performance than the metal taps and valves commonly used today. The engineering plastic they chose was Delrin 500PL.

Traditional metal taps are inferior to the plastic water taps moulded in Delrin 500PL in many respects: a special long-life mould is used in the manufacture of taps moulded in Delrin, and the smooth internal surface of the tap produces far less wear and has greater durability; and taps in Delrin are not subject to corrosion, because Delrin is chemically inert.

Consequently, taps in Delrin are less affected by hardwater and will not accumulate deposits. Metal taps, however, are rapidly corroded by hard water, and oxides are deposited on the inside of the bore. Additionally, because Delrin has a very low coefficient of friction, the moulded taps are much easier to turn on and off.

Taps in Delrin can also be colour coordinated to suit the most modern bathrooms and kitchens. Watertec taps moulded in Delrin: a high-performing, low-cost tap for the consumer the international market.

Delrin helps redefine the 'daily grind'

Pepper mills on tables in homes and restaurants around the world attest to consumer appreciation of black pepper. Now McCormick Schilling is making it possible for the public to enjoy the savoury appeal of table-ground green and white pepper, as well as all-spice, coriander and mustard seed.

A grinder that screws onto McCormick Schilling spice bottles in place of a cap has recently been introduced. Users upend and twist the bottle in place to mill just the amount of spice desired. Naturally, McCormick's major specifications were product safe-guards: the grinding surface could not be made of any material which would chip or abrade, screws or hardware that might come loose were not be used.

That made Delrin acetal resins the logical material to use. Its strength, hard surface and wear resistance provided the durability essential to both the grinder and the collector ring, between which a spice is crushed. Delrin's natural lubricity and especially its spring-like properties were also essential. The end result? A quick and tasty redefinition of "the daily grind".

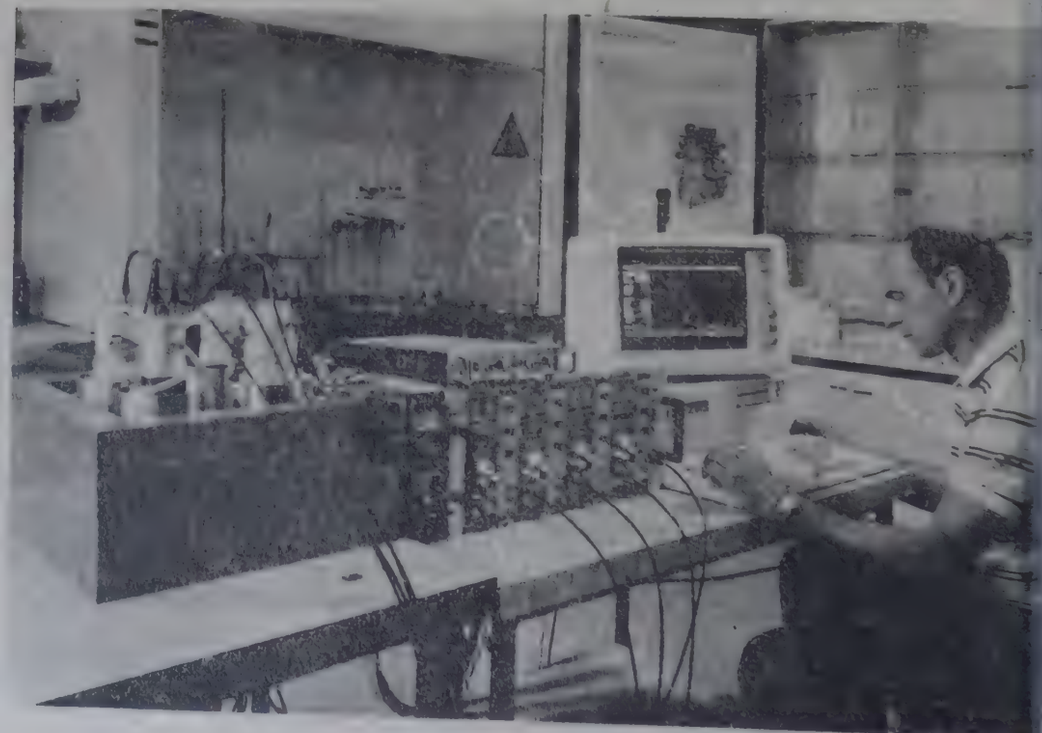
MEASUREMENT OF MATERIAL LOSSES DUE TO WEAR AND CORROSION

Sulzer has introduced the thin-layer activtion (TLA) method for measurements of machine components on test beds or in industrial installations. This method enables the measurement of even small to minute material losses due to corrosion or wear. It involves producing radioactive atoms in the surface layer (typically 10 to 200 µm deep). The removal of material is measured via the residual activity.

The small activation depth and the extremely low concentration of unstable nuclei in the activated material (about 1 active to 10^{10} normal atoms) result in merely a very small total radioactivity. Only elementary safety measures are therefore necessary. On the other hand, it is often necessary to shield the measuring system from the natural radioactivity by suitable provisions. The very small number of transformed atoms also means that the mechanical and chemical properties of the metal surface are unchanged. In addition to the usual metallic engineering materials, ceramics and polymers may be activated, though it is possible that the properties of these could be changed.

Two measurement methods are used. The difference method consists of measuring the drop in activity due to the loss of material directly on the previou radioactively marked place. The ac measurement can be made from outs e.g. through the wall of a housing pipe) during the erosion process (in s Where a closed cooling or lubricat oil circuit is available, the concentrat method may be used. Here the incre of activity in the lubricant or coolan measured. Using the TLA meth material losses from less than 1µm to a few hundred µm can be measur Depending on the method and the me suring conditions, the accuracy a reproducibility range from about 0.1 1% of the measured value. Under op mal conditions, the lower limit is abo + 0.01 µm (difference method).

Besides measuring homogeneo erosion over large areas, TLA may exploited also to detect pitting. For th purpose, the surface is activated wi two different isotopes and different pe etration depths. Whereas with homog neous material loss there is a defini ratio between the residual activities the two isotopes, governed by the act vation profiles, with local attack ther is a shift in favour of the isotope wit the greater activation depth. Typica applications for thin-layer activation ar the measurement of the mechanical c



Measuring rig for determining erosion by means of thin layer activation (TLA)

ve wear on engine components
as cylinders, pistons, bearings,
or the loss of material on
ion-stressed parts like pipelines
ying acids, pumps, reaction ves-
or chemical processes, or on art-
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etermination of erosion by fast-
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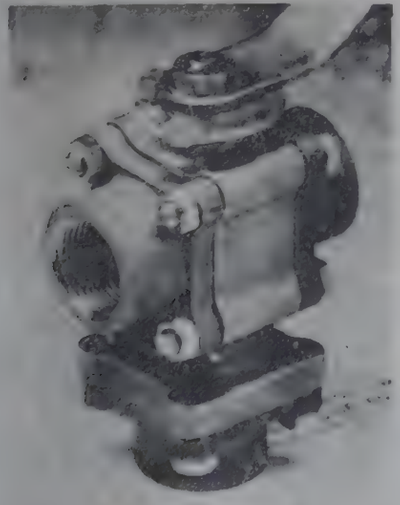

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TITANIUM NITRIDE COATED THERMOSENSORS FUNCTION LONGER

Until recently, the upgrading of highly stressed components by means of titanium nitride coatings was reserved for space travel and medical engineering applications. The present further utilization is due firstly to the excellent resistance to wear provided by the coating and, secondly, to the fact that its wide range of possible applications has been recognized by engineers.

The Sawi titanium nitride coated stock temperature sensor, type SW 143, is a result of the combination of the two factors quoted above. Designed as a screw-in thermoelement, the SW 143 is eminently suitable for the direct measurement of temperature within plastic extruders or injection moulding machines. Due to the presence of the extremely hard titanium nitride coating, the sensor can resist even the abrasion-induced wear caused by plastic stock containing fillers. Hence equipment operating life is increased, the maintenance of the extruder simplified and the service life of the sensor lengthened by some orders of magnitude compared with that of traditional stock temperature sensors.

A replaceable sheath thermoelement with a time constant of less than 0.5 seconds forms the measurement part of this high-quality temperature sensor. The thermovoltage corresponds to DIN-IEC 584. Normally, the immersed part of the sensor is tapered, but it can also be sword-shaped to further good flow characteristics. The design of the screw-in and sealing parts depends on the particular pressure and fitting conditions. Matching can take place to any pressure transducer assembly bores already present. The connection line features thermostrand with fibre-glass insu-

The service life of the titanium nitride coated stock temperature sensor, type SW 143, is some orders of magnitude longer than that of traditional sensors.

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lation, silicone impregnation and non-rusting wire brading.

For more information contact: Sawi-Electrotechnik AG, Hegistrasse 37, Postfach 56, CH-8404, Winterthur.

SLUDGE CONVEYOR

Indiana's Sludge conveyors are designed to remove heavy organic solids from industrial slurry/wastes. They are generally used in fertilisers, chemical, iron and steel, thermal power plants (ash removal/extraction), sewage treatment, engineering and various other industries. The equipment consists of a specially designed tank with scrappers mounted between heavy duty continuous chains. The tank is provided with a specially designed sealing arrangement to prevent leakage. The tank is suitably designed so that the inclined portion provides access for the material to be discharged at any convenient height.

The liquid along with heavy inorganic solids is first allowed to settle down for a calculated period of time, but in some cases if the solids are very heavy it can operate continuously. The settling time varies for different materials depending on their characteristics. After the heavy solids settle down, the conveyor is started. The scrappers, scrap the material settled at the bottom of the tank, which is effectively discharged. In case of very sticky material special cleaning arrangement is provided at the discharge. The complete operating cycle can be made automatic by introducing a timer device, i.e. after a calibrated time, the conveyor will automatically start and stop.

For Further details contact — Indiana Engineering Works (Bombay) Pvt. Ltd., 12, Hingorani House, Dr. Annie Besant Road, Worli, Bombay-400 018.

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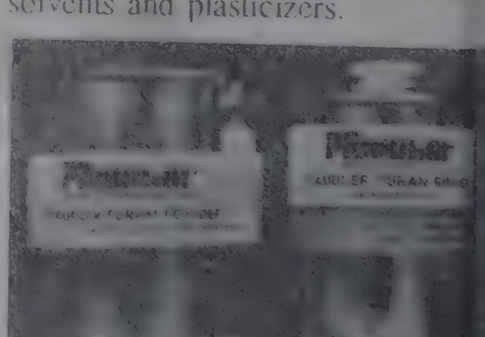


For further details contact: M Rahul Industrial Corporation, 13/ Dariyasthan Street, 1st Floor, Mas Bunder Road, Bombay-400 003.

Chemical Plant Developments

JAMES LOCK
Consultant Editor, *"Processing"* London

IATURE OXYGEN NSDUCER DESIGNED RUGGED USE

vomex has introduced a miniat- ransducer designed for making ate oxygen measurements. The mex 1111 is said to be the smal- f its type, using the paramagnetic iple to make it a lightweight, d unit.

e paramagnetic technique is a sen- method for measuring volume ptibility. Oxygen is almost alone at it is attracted into a magnetic In the Servomex cell, the oxygen ntration is detected by means of nb-bell mounted on a torque sus- on in strong, nonlinear magnetic The higher the oxygen concentra- the further the dumb-bell is cted.

e deflection is detected by an opti- ystem and twin photocells con- d to an amplifier. Around the dumb-bell is a coil of wire through which a current is passed to return the dumb-bell to its original position. The current measured is directly proportional to the oxygen concentration.

The advanced design of the Servomex 1111 allows it to be constructed with the minimum of internal gas volume, giving it an exceptionally fast response capability. For example, a 50 ml/min sample flow rate can give a response time of less than one second.

The design also gives a high degree of flexibility, allowing it to be configured to suit a wide range of applications. For example, it has allowed the features of the paramagnetic principle in gas blending, pressure swing absorbers, ventilation systems and fruit storage. The transducer can also be applied in medical equipment for pulmonary function testing, ventilation and other physiological applications.

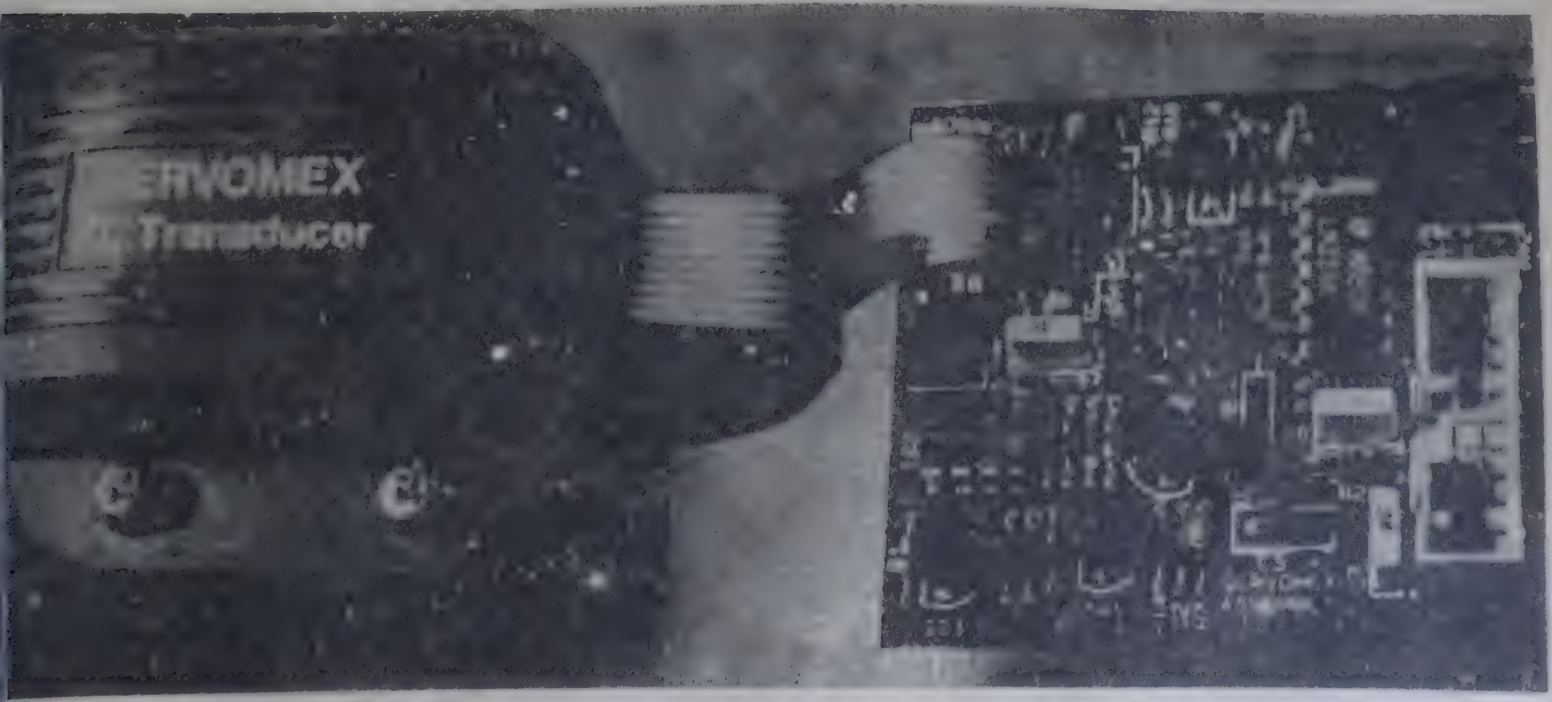
For further information, contact: Servomex (UK) Ltd., Crowborough, East Sussex, United Kingdom, TN6 3DU.

ON-LINE DISTILLATION ANALYSER WITH MICRO-PROCESSOR CONTROL

Ludlam Sysco, a Rotork Analysis company, has announced a new Hone on-line distillation analyser with microprocessor control. The Hone Distillar 2000 replaces the previous Distillar model.

The company says it is much more versatile and incorporates a significant range of performance improvements. These include better boiling point detection and more accurate end point measurement.

The new features include an optoelectronic measuring device which detects the surface level of the extracted liquid to ensure an accurate sample volume is taken and continuous elec-



The Servomex 111 miniature oxygen transducer

tronic monitoring of all services. The design is to CENELEC (European Electrical Standards Coordination Committee) requirements for use in hazardous areas.

It is intended for completely automatic distillation analysis in the process stream of petroleum products, and is also suitable for a wide range of liquids. These can be any liquid boiling between 30°C and 300°C and chemically stable during distillation. The programmable Distillar 2000 analysis unit reproduces the IP 123 and ASTM D86 laboratory tests and the IP 195/81 (ASTM D1078) if the boiling range is greater than 30°C.

Control can be local or remote. Operation is normally continuous, but the use of a dedicated Hone PC-operated software package allows the analyser parameters to be changed during an operating cycle.

Four Status Outputs

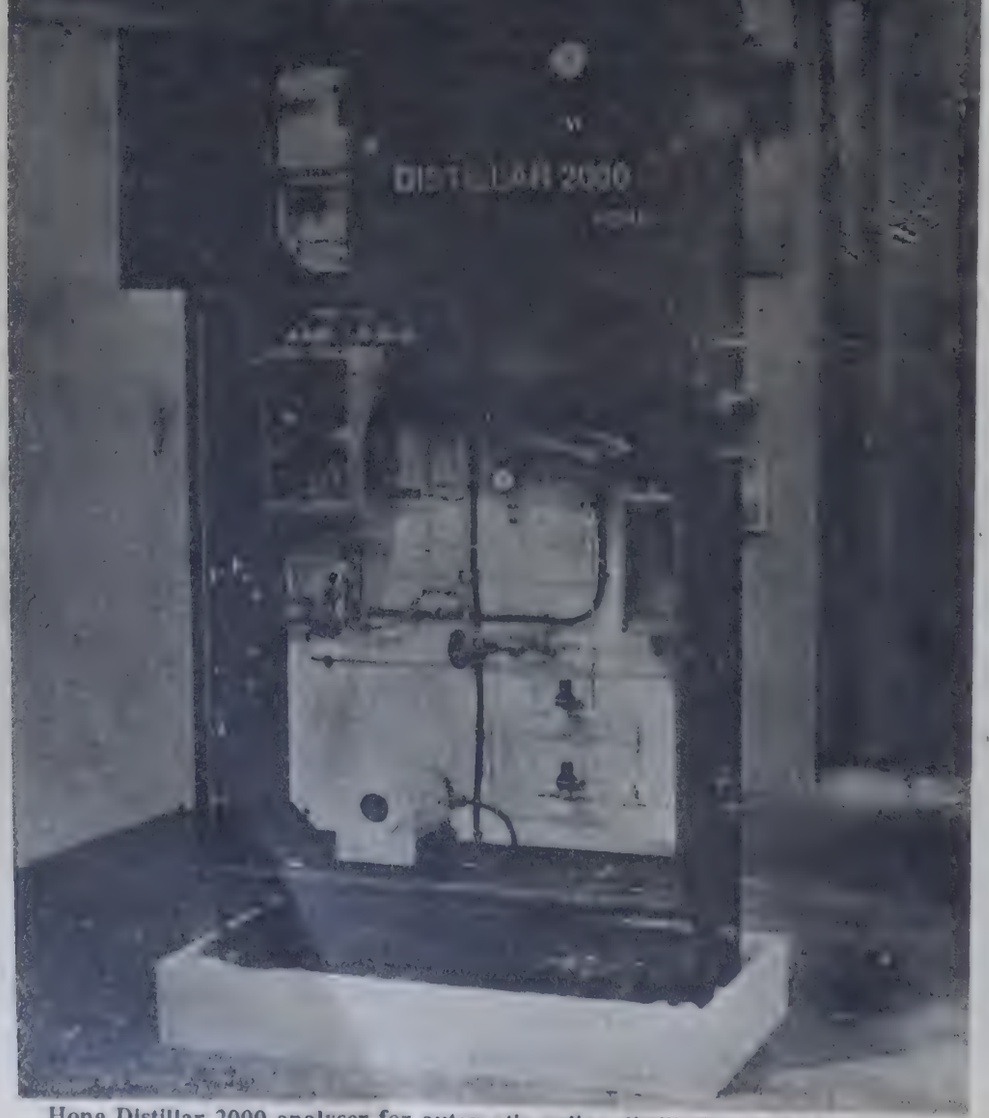
Properties that can be determined are initial boiling, recovery, distillation and end points. Twenty-one individual heating rates can be programmed from start to initial boiling point (IBP) and for every 5% recovered up to end point. An extrapolation from the first 0.5% of recovered volume determines the IBP with the end point transmitted as the highest temperature reached before a recorded drop of about 5°C (pre-set depending on application).

Input/output features include seven fully-isolated, 4-20 mA trend outputs, available to provide information on a predetermined combination of the me sured properties. Alternatively, two ou puts can be used to obtain a fi distillation curve, leaving five outpu for trends.

The internal status of the analyser indicated locally on an integral alph numeric display. There are four statu outputs: ready, heating, hold acknow ledgement and warning. A serial RS23 interface provides the option of trans mitting indications of status to a remot operator station.

External inputs from intrinsicall safe, volt-free relay contacts allow fo four control parameters. Standb immediately stops the analysis in pro gress, clears all stored values, and await further instructions. Hold allows com pletion of the current analysis cycle wit retention of data. The other two input are alarms.

For further information, contact Ludlam Sysco Ltd., The Broadway Market Lavington, Devizes, Wiltshire United Kingdom, SN10 5RQ.



Hone Distillar 2000 analyser for automatic online distillation analysis

NEW GENERATION OF PERISTALTIC PUMPS

Watson-Marlow, a member of the Spirax-Sarco Engineering Group, has launched a new peristaltic pump which allows the user to dial up the required flow rate, dispenses with using single or multi-channel pump heads, and can be controlled by both digital and analogue process signals.

The company says the 505Di, the first of a new generation of peristaltic pumps it is planning, is both the most advanced peristaltic pump for process control (accepting digital or analogue signals) and its fast, easy and fail-safe menu-driven control makes it the most advanced manual control peristaltic pump available.

The Watson-Marlow 505Di peristaltic pump

One feature of the 505Di is that the er is prompted to input information, king which pumphead is fitted, gether with the bore size of the tubing, provide final flow rates up to more an 2 litres/min. It has a step-through enu structure to give easy access to all t-up, calibration and operating modes. 21-key membrane pad and a 2 x 16 aracter backlit liquid crystal display ovide the control interface.

gital and Analogue Control

The 505Di is three pumps combined one. The first is a sophisticated anual control pump with a choice of ve different pump heads, a speed con- ol ratio of at least 100:1, and rapid aking. An important addition is the clusion of flow rate look-up tables and libration facilities.

The second version offers dispensing weight or volume. The pump can peat a "learnt" dose either on receipt a signal command or at a set interval ne. Provision has been made for justing the dose if operating condi- ons cause drift in flow rates, and a int-out is available for auditing pur- oses.

The third and most advanced feature digital and analogue control. Digital ntrol of all drive functions is made ssible by RS232 data ports, and up to 16 pumps can be linked together. In addition, ASCII commands can be used for speed, direction and stop/start control.

The 505Di also accepts analogue process signals up to 60V or 3 μmA to provide a rising or falling flow against a rising signal. Remote stop and direction of rotation is available too.

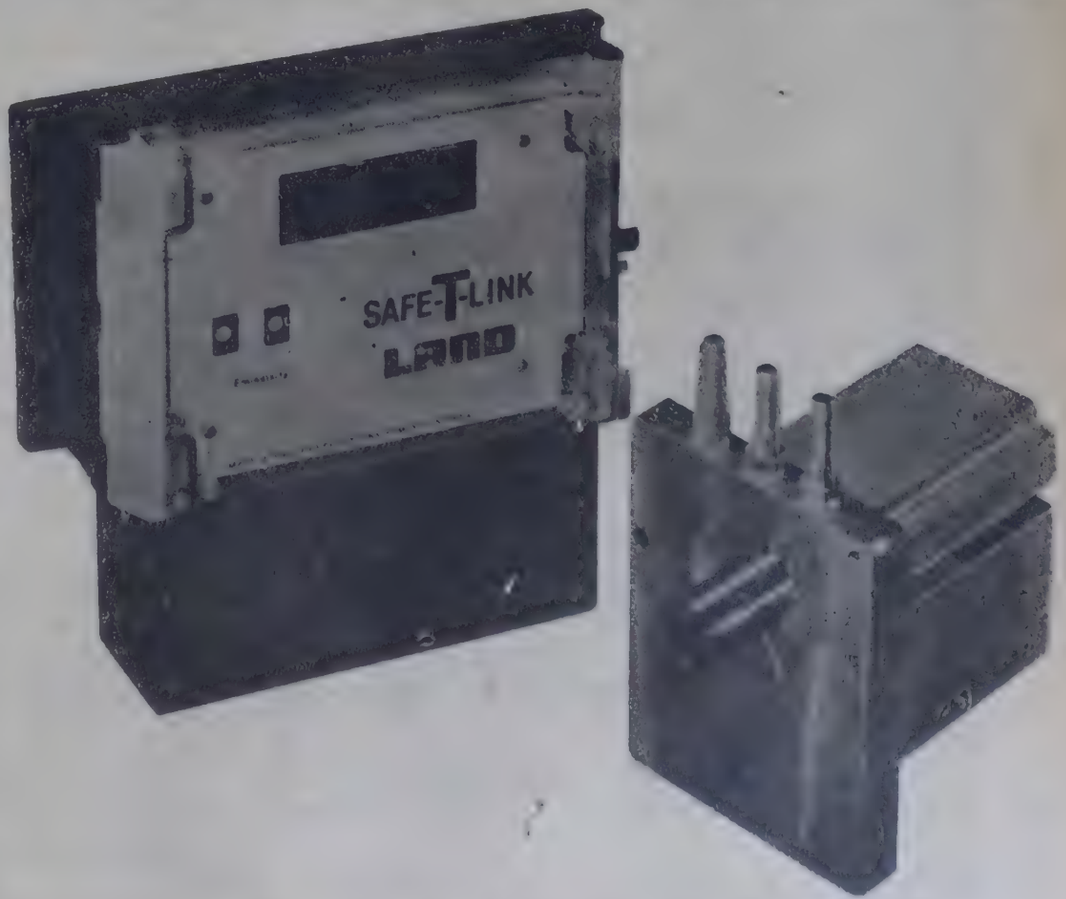
The latest development is a new pumphead designed for accurate dispensing at flow rates up to 3 litres/min. The 505L uses a double tube element and six stainless steel rollers to provide essentially pulse-free flows.

Tube loading is easy with the 505L pumphead's top-loading sprung track. The use of 2.4-mm wall thickness tubing allows higher suction and the ability to handle more viscous fluids. The 505L is an addition to the range of some 14 pump heads.

For further information, contact: Watson-Marlow Ltd., Falmouth, Cornwall, United Kingdom, TR11 4RU.

"NO WIRE" RADIATION THERMOMETER

The Land Safe-T-Link radiation thermometer from Land Infrared is said to achieve the first ever true "no wire" operation in industrial environments containing inflammable gases, explosive atmospheres, high voltages and high levels of electrical noise. It is configured



The Safe-T-Link radiation thermometer from Land Infrared

as a fibre optic sensor requiring no electrical connections, either power supply or output signal.

Land says the simplicity of installation, which totally eliminates problems of electromagnetic interference with the use of non-conductive optical fibre, also makes the instrument well fitted for many other general purpose applications.

The Safe-T-Link head, including power cell, is certified intrinsically safe, specifically EEx is IIC T4. It can be installed in areas where inflammable gases are continuously present. There are no electrical connections to the sensing head, merely the optical fibre.

Hybrid Extrinsic

The thermometer will operate for three to six years from a single lithium thionyl chloride cell. Alternatively, a simpler arrangement of six A-A alkaline cells with a life expectancy of one to two years can be used. Both options are packaged intrinsically safe and can be readily replaced inside the hazardous area.

Safe-T-Link is a hybrid extrinsic, fibre optic sensor comprising infrared sensing head, fibre optic and receiver/-display unit. The sensing head defines the measurement spot on the target surface from which infrared radiation is collected.

A thin film thermopile detector transduces the collected radiation into an electrical signal. A filter limits the operating wavelength to from 8 to 14 μm, which corresponds to an atmospheric transmission window.

The signal, essentially a non-linear analog of target temperature, is am fied, encoded and transmitted as a t of light pulses along a standard 200 communications optical fibre. The o cal fibre couples the head and the re ver/display unit which can be remo located up to 1 km away in a n hazardous area. The mains powe receiver decodes the optical pulse tr computes the target temperature, li arises and compensates the measu ment for a user set target emissiv value, and provides a light emitt diode (LED) display of temperatu Additional 4 to 20 mA and 1 mV, outputs are also available for connect to any process computer, controller recording equipment.

For further information, conta Land Infrared, Division of Land Inst ments International Ltd., Wreakes La Dronfield, Sheffield, United Kingdo S18 6DJ.

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Diffidence in Indian Chemical Industries

N.S. VENKATARAMAN*

The recent Gulf crisis and the steep increase in the prices f the petroleum products, all over the world, has clearly xposed the weakness of Indian chemical industries and the iffident attitude of the managers of the Indian chemical ndustrial scenario. Operating in a highly protective and early closed economy, the chemical industries in India lways appear to be living on borrowed times and with the upport of the crutches. The promoters of the chemical projects in India always appear to depend more on the Governent's fiscal policies, taxation measures, subsidies and ncentives to make profits and achieve growth, rather than echnology upgradation, process optimisation and appropriate methods. Even when such steps are adopted, the approach often appears to lack the type of determination that should e associated with such efforts. Looking always like a weak hild constantly requiring medical attention and care, Indian hemical industries are watching the international scenario nd Gulf crisis with confusion, fear and near feelings of lespondency. As usual, it looks upon the bureaucrats and the politicians running the Indian Government to find out solutions for their problems, while the Government itself appears o be no less uncertain.

The lack of fighting qualities in the Indian chemical industries is very much evident and it becomes obvious at every moment of crisis and difficulties. On every such occasion, whether it would be the shortage of raw materials, price increase of inputs, or increase in operational cost due to various reasons, the chemical industries in India simply respond only by raising the prices of the finished products. This has been repeatedly happening during the last four decades, after Independence. The average Indian consumer would habitually murmur a word of protest and then would meekly accept the situation as inevitable. The entire chemical industry in India appears to be going through a process of explaining away the situations and justifying the price increase all the time. The net result of the situation is that the country's chemical industries, do not have any hope of becoming competitive in the world market at any time, which only mean that the country can never ascend in the international ladder of advancement, with the requisite pace and speed. It appears that the Indian chemical industries, will occupy only the bottom steps of the ladder in the international chemical industrial scenario in the foreseeable future.

The biggest failure of the Indian chemical industries is that no effective or worthwhile steps have been taken in the last few years to bring down the cost of operations or the cost of the products in the scale and manner required. Development and impressive growth can come around only by adopting innovative methods, appropriate techniques and constant search for betterment. The scale of operations, choice of technology and the level of perfection in design and operational methods in India are often found to be far too inadequate to make any sort of immediate impact in the world chemical market scenario. The tremendous advantages due to the size of our land, varying tropical and seasonal conditions, available deposits of minerals and raw materials, etc. certainly provide India with enviable opportunities; but only the requisite quality of mental makeup and determination to achieve time bound objectives are absent in most of the Indian chemical industries. We often, boast ourselves about the comparatively small and meagre achievements, while ignoring the missed opportunities, conspicuous failures and inadequacy of the response to the challenges ahead.

There is no hope of the Indian chemical industries getting out of the present mess, unless it attempts to work out original techniques and methods based on Indian advantages, to free itself from the present vicious cycle, due to undue dependence on overseas technology and methods which have been designed for different conditions. If the Indian chemical industries were to move forward with speed to catch up with the developed countries, it becomes absolutely essential that we should not follow the pattern of growth of developed countries blindly. In such a case, the present distance between the Indian chemical industries and those in the developed nations, will be maintained all the time and we will continue to be behind the advanced countries by atleast three decades, which is the present situation.

Instances of the production of a number of sophisticated chemicals do exist in India, but they are of comparatively small scale and at high cost levels, which will not by themselves make any sort of positive impact on the overall state of Indian chemical industries. Most of such chemical projects, producing sophisticated chemicals, have come up with the technology acquired from abroad, at high cost to the nation in terms of foreign exchange; with little hope of earning back the foreign exchange by export of the products produced.

The import of chemical technology during the last three decades have not led to the chain effect of growth in a significant manner, commensurate with the foreign exchange spent over the years. On the other hand, each act of import of technology appears to be an end in itself. This is amply

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proved by the fact that the country has imported the same technology for the same product several times through several individual organisations in the past. Many examples of such repeated import of technology can be readily cited. Just to cite one example — India imported technology for titanium di-oxide manufacture by sulphate route from abroad five decades back and the technology for chloride route titanium di-oxide project was imported from abroad one decade back We are still looking for the imported technology for the TiO_2 manufacture now.

It is very sad to see the Indian industrialists frequently visiting the foreign countries with begging bowl for technology. The extent of such technologies sought from India has become so widespread, that several international organisations often complain that, they get too many enquiries for technology from India, without adequate background informations, inadequate details of the requirements and without convincing cost-benefit study of such imported technology for the Indian conditions. The obsession with foreign technology, both on the part of the industries as well as the Government owned industrial financing institutions, have often resulted in the import of technology not fully suited to India or required by India. Such a situation has also been contributed by the fact that the Indian R & D scientists and CSIR laboratories have not been able to generate faith and confidence amongst the Indian industries and investors.

The diffidence in the Indian chemical industries about its competence to generate and implement original and innovative ideas is quite evident. The praiseworthy efforts made by the Government of India to promote indigenous R & efforts, as a means of self-reliance in technology, by settir up a large number of CSIR Labs have not yielded adequa results to the level of expectations or need. Considering th encouragement and incentives provided and the number c persons employed, the R & D efforts in India have not pr vided commensurate benefits to the nation. The scientists an the technologists, both in the private and in the public sect have largely to accept the blame for this situation.

A drastic reorientation in the attitude of the Indian chem ical industries to its requirements is urgently called for. Th challenges of the dynamic world should create matching fight ing qualities leading to determined R & D efforts and orig inal ideas to find optimum solutions.

Considering that the Indian chemical industries, by and large, is very much behind the developed world, a far greater level of efforts than that of the advanced countries themselves is required in India, to catch up with the developed countries. To do this, the primary requisite is that the tendency to simply adopt western technology as an easy way out, should be totally given up. Such an attitude should be replaced by an aggressive approach to identify appropriate technologies and processes. Such aggressive orientation in attitude and approach will automatically ensure that the diffident attitude is erased, just as mere entry of light would eliminate the darkness. The battle for the future of the Indian chemical industries has to be won in the minds and hearts of the persons, associated with it at various levels and positions.

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nproved Features of Ammonia, Methanol and Urea Technologies

A.K. BHADURI*

bout 80 per cent of the total energy required in the con-ion of ammonia to urea is consumed by ammonia alone. result, ammonia production cost is shared by the energy and capital related cost in almost equal measure. There-, selection of ammonia technology should be based on rgy economy as well as capital cost. The reason attrib-le to the poor prformance of most ammonia plants is low stream efficiency due to high down time resulting from cheduled stoppages/trips and equipment failures. The nnology for future ammonia plants should, therefore, be nmercially proven with a high degree of operation reli-lity. Experience gathered from design and operation of ently built gas-based ammonia-urea plants has generated siderable confidence in indigenous technological capa-ty which should be put to use with progressive upgra-ion of technologies wherever needed for the development improved and commercially proven ammonia-urea pro-ss technologies. The present article attempts to present the te-of-the-art as well as appreciation of technology high-hting specific features of available ammonia-urea and thanol process tehnologies.

The first part of this article deals with improvements in mmonia process based on the petroleum derived feedstocks, e natural gas and also recently developed gasification tech-logy of non-coking coal. Improvements in urea and meth-ol process technologies are covered in the subsequent part the paper. The purpose of the article is not to emphasize loption of any particular process but to get an insight into cent improvements.

MMONIA

The basic design philosophy of any ammonia plant should e based on following cardinal objectives:

Maximum plant reliability,
High degree of process efficiency and
Low investment cost.

The principle is not necessarily to develop or opt for least nergy consuming process but to design the most econom-al process with respect to energy efficiency, cost and perational reliability. Any additional investment towards energy efficiency has to be traded off with the cost of energy saved.

Plant reliability is the first and foremost factor in formulation of basic design philosophy. Although, energy saving features are desirable they are not to be sacrificing the plant reliability. Energy saving can often be an inverse function of process reliability and plant complexity. Designed process efficiencies and optimum energy consumption are realised only when plants operate at near design capacity levels on a sustained basis and at steady operating parameters. Frequent stoppages and startups invariably contribute for heavy energy loss in the form of feed, fuel and utilities and at the same time are detrimental to the health of the plant machinery and equipment with atttending reduction of on-stream efficiency and catalyst life.

An untried design incorporating unproven process steps might cause recurring plant outages expending considerable amount of energy. Similarly, a plant with poor onstream efficiency is expected to consume higher than average energy on annual basis. Obviously, from economic stand point what matters is the overall yearly energy consumption per unit of ammonia produced rather than energy consumed at any instant when plant is operating under steady state at rated capacity level. It is an undeniable fact that in a situation of continuously escalating energy cost and scarcity of the energy resources, optimisation and improvement of energy consumption is not only relevant but also desirable and, accordingly, a great deal of emphasis has been put on this aspect in recent years. It can thus, be concluded that a well designed plant with enhanced reliability is more desirable than reduced energy consumption in an unreliable system.

Hence, it is imperative that the technology is properly applied with good engineering practice in order to minimise failures, upsets and recurring equipment problems for achieving high on-stream days and plant availability. Factors which ensure maximum reliability in plant operation with high on-stream efficiency and plant load factors are summarised below:

* Adoption of commercially proven process steps preferably in a conventional system.

* Utilisation of commercially proven plant machinery, espe-

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cially those of critical nature and having good performance track record.

* Milder process parameters to ensure extended operational reliability.
* Flexibility in process design so that any marginal upset in one process step can be countered in down-stream process steps while maintaining process efficiency and on-stream time.
* Use of reliable process control systems with provision for continuous monitoring of plant performance and condition of rotating machines/equipment.
* Process optimisation through computer simulation to ensure stable process operation and better energy efficiency.
* Selection of such utility system which enables milder operating conditions with minimum sacrifice in energy efficiency.
* Removal of impurities in feedstock, intermediate process stream and process water to derive longer catalyst life.

Additional investments are sometimes justified towards, for example, upgrading heat exchanger and reformer tube metallurgy, providing spare critical rotating equipment, incorporation of specific vents and isolation valves for improving operatibility, provision to LT shift guard vessels and sizing of exchangers for limiting conditions.

The energy consumption in ammonia process depends upon both internal and external factors, the former being specific to the process when energy saving devices are incorporated.

The external factors like, cooling water temperature, ambient temperature, feedstock composition and inlet conditions, ammonia temperature and degree of CO recovery etc. will greatly determine energy requirement and do not have any bearing on the process technology itself.

The energy input in ammonia process is in the form of feed, fuel for reformer and auxiliary boiler. Feedstock losses are generally low in all well proven technologies. But there are number of areas that can be identified for energy losses in fuel consumption. Hence, process design must ensure.

minimum drive power requirement;
minimum heat requirement for each process step and maximum process heat recovery.

Improvement in centrifugal compressor design through isothermal compression providing interstage cooling and using vaned diffuser and open backward impeller for low pressure casing have considerably contributed towards the improvement of drive machine efficiencies. Reduction in energy consumption in compressors is a function of the design of compressor driver. For instance by increasing rotating speed, with steam as well as cooling water consumption can be reduced by 6-9% over conventional design. Reformer fuel consumption can be reduced with mild reforming conditions. Waste heat from process steam is recovered as steam after secondary reformer, HT shift and synthesis converter. In an optimised steam system, HP superheated steam is generated in these waste heat boilers and is used for driving steam turbines of the syn gas and process-air compressor and after expansion through back pressure turbines is returned as process steam.

Unconverted methane and inerts are extracted either as purge gas from synthesis loop or from the upstream from makeup gas feed to synthesis loop and are used as supplementary reformer fuel. Nearly 50 percent of the fuel used in the reformer is used for maintaining the endothermic heat of reaction. The balance is utilized as sensible heat in reformer flue gas in the convection zone of the furnace to preheat the various feed streams. The optimum heat recovery systems are designed to restrict exit flue gas temperature to 100-140°C subject to the limit of condensation temperature of sulphur compounds in flue gases.

In general, 94%-95% of process feed gas is converted to final product when the losses are accounted for as:

* unconverted CH_4 in process steam,
* unconverted CO,
* hydrogen consumed in the methanation of CO & CO_2
* syn. gas loss with purge gas and
* compressor losses, valve leakages and other miscellaneous losses.

All these losses, of course, are quantitatively recovered as fuel value in the form of purge gas from the synthesis loop and are recycled back to the fuel system. Even then, considerable amount of energy is expended in processing the syn gas in sequential steps from front end to make-up gas preparation section and in pushing through the synthesis loop. Obviously, inspite of the decrease in the sum total of process feed and reformer fuel, a reduction in overall energy value can be foreseen.

Various key process parameters will significantly influence the improvement of energy efficiency of the process. The controlling variables in syn. reformer section are:

* steam to carbon ratio in the inlet of the primary reformer;
* preheat temperature of process feed, process air and combustion air;
* methane leakage from primary and secondary reformer exits and
* consumption of process air.

With the use of more active reformer catalysts and better reformer furnace design, a steam to carbon ratio as low as 2.5 is adequate for equilibrium

LT shift conversion when LT operates at 200°C with CO age of 0.3% vol. (dry). But in order to avoid any Fis- Tropsch reaction leading to the formation of methane lower olefins with conventional chromium based iron e catalyst at low steam dry gas ratio, higher steam carbon in the range of 3.2-3.3 is desirable. The recently devel- l copper containing active shift catalyst may however, the way for reduced steam carbon ratio.

he decarbonation process also dictates the S/C ratio. For sical CO removal system, low S/C ratio is justifiable but purity and extent of CO recovery is insufficient to ensure conversion of ammonia to urea. When nearly full recov- of CO is desired, excess steam with S/C ratio of 3.3-3.5 enerally used to supply the heat of regeneration or strip- g energy for the solvent. As mentioned earlier, mild orming condition with higher pressure and lower temper- re allowing higher methane slippage at the exit of pri- y and secondary reformer decreases radiant heat duty with sequent reduction in fuel consumption. Higher conver- n in the secondary reformer, which is thermally more effi- nt with excess process air at higher temperature, cuts down primary reformer duty. Energy saving can also be aug- nted by molecular sieve drying as the final step of the keup gas purification for moisture and CO removal so that makeup gas can be fed directly to syn converter along h recycle gas. This step gives rise to low syn gas recycle l refrigeration horse power.

Synthesis conditions can be altered for higher conversion pass at lower pressure and lower pressure drop with aller particle size of the synthesis catalyst. Various types synthesis converters like axial flow, radial flow and hor- ntal converters adopting several techniques of heat removal tween catalyst beds via quenching and/or indirect heat change cooling are employed. Energy consumption in syn- sis reaction is mainly a function of temperature at which themodynamic equilibrium, is achieved in the reactor. verall energy consumption does not vary significantly when nthesis is carried out at 80-220 bar. The operating param- rs are guided by high pressure super-heated steam gen- tion, size of the synthesis reactor, heat-exchangers, piping d balanced synthesis/recycle compressor. The optimum nthesis pressure level recommended by almost all tech- logy vendors varies between 140-160 bar.

All the available low energy ammonia processes incor- rate certain process features to derive energy improve- nt in the system. But it is of utmost importance to select echnology ensuring high operational reliability at the same ne having the features of simplicity as well as equipment d machinery of proven track record.

The present day ammonia plant should necessarily have to have proven hardware. The critical areas of importance in this regard are ;

* Primary Reformer design (terrace wall, side fired/top fired),
* Secondary Reformer Design,
* Process — gas — cooling — train down stream of Secondary Reformer and ammonia synthesis converter i.e. waste heat boiler generating high pressure superheated steam and
* High efficiency ammonia converter with proper gas flow and pressure drop having simplified design.

Scarcity of petroleum derived hydrocarbon feedstock and fuel and drive for the conservation of petroleum based liquid fuels can command review of energy policy in the near future. On energy equivalent terms, available coal reserves in our country is nearly hundred times more than that of crude oil. Coal conversion technologies based on Indian non-coking coal, therefore, merit consideration. As a first step, total coal gasification technology plays a key role in the production of syn. gas ($CO + H_2$) as precursor to a host of downstream technologies such as ammonia, methanol, gasoline and other chemical building blocks which otherwise would be petro-based.

Selection of candidate coal and its characteristics has a direct relationship and impact on the choice of coal gasification process especially with respect to ash content, VM, moisture level, ash composition and fusion temperature which differ widely from source to source. Hence, no commercially proven gasification process is versatile to accept the coal of any quality. The desirable coal characteristics for gasification are low ash content, low moisture and moderate ash fusion temperature. In general, coal gasification processes can be classified into three generic type namely, fixed bed, fluidised bed and entrained bed, each possessing its specific characteristics making each one more suitable for a particular coal and the desired end product.

Commercially available gasification processes have been developed using oxygen and steam under varying operating conditions. For synthesis gas ($CO + H_2$) production, the gasification process which yields maximum quality of syn gas without secondary processing preferably at high pressure, should obviously be the logical option. Any methane produced, if not used as fuel in the plant system, will need to be reformed into H_2 and CO. High pressure syn gas production is advantageous as it can be charged to the reactor pressure for further conversion with boosting for economising power consumption. The objective is generation of the largest quantity of equivalent CO & H_2 atleast cost per unit of coal processed. Economics is determined by the factors such as gasifier size and throughput, oxygen and steam ratio as well as the pressure of the syn gas produced besides commercial experience, safety aspects and environmental pollu-

bed gasification at lower pressure or Kopper Totzek atmospheric entrained bed gasification are all commercially proven first generation technology. Pressurised entrained flow gasification of Krupp Kopper or Kellog Rust Westinghouse gasification with ash agglomerating technique or IGT fluid bed gasification also involving ash agglomeration or British Gas Lurgi's development of slagging gasifier or Davy Power Gas high temperature and high pressure gasification are all at the pilot or demonstration stage and are yet to be commercially exploited.

Among the new generation technologies, Texaco's Coal Slurry Gasification has been commercially proven for syn gas, methanol, ammonia and combined cycle power generation. The gasification process comprises entrained flow type gasifier with no moving parts and internals and operates at high temperature with oxygen and coal-water slurry as feed.

The process produces no liquid hydrocarbon by-products thus eliminating the need for by-product processing. The high temperature operation of the gasifier minimizes environment pollution. Ash removal system, in liquid form by quenching in Texaco gasification, provides an excellent method of handling and disposal of ash. Waste water quantity is small and fully recycled.

In Texaco gasifier, specific coal throughput is quite high. Normally coal throughput in a gasifier is dependent on pressure, coal slurry concentration and end use application. A full scale gasifier can gasify in excess of 1000 te/day of coal which eventually reduces the number of gasifier for any given plant capacity (nearly half the number of Mark-IV Lurgi gasifier). The raw gas is passed through venturi scrubber for the removal of ash and carbon particles. Subsequent gas processing steps follow the conventional route of HT shift reaction, Rectisol Desulphurisation and Decarbonation and Liquid Nitrogen was for final purification prior to synthesis. Operating experience of Texaco gasification for ammonia production is available from Ube Industries, Japan which is reported to have achieved 98% capacity utilisation for the last one and a half years (since April 1985) for its 1000 tpd ammonia plant. The carbon conversion efficiency is reported to be over 96%. Indian coals of different origin — Raniganj, Singrauli, Singerani have been tested in Texaco laboratory for establishing gasification properties and the results are encouraging *prima-facie*, confirming amenability of Indian coals for this process.

Small capacity ammonia plants in the range of 200-300 tpd with captive urea plant can now be conceived based on high aromatics naphtha at suitable dispersed locations for easing fertilizer transportation bottlenecks as witnessed for larger units. The fertilizer produced from such units can be economially transported by roadways at nearest consumption

but is based on scaling down of larger capacity low ene optimized conventional steam reformation process. Conv tional reformation followed by HT conversion with poly PSA system can be an alternative option for small size pla For full conversion of ammonia to urea, an attendant removal system would need an upstream of PSA unit. Ano breakaway technology from classical reformation route is recent development of ICI as energy efficient LCA (L Cost Ammonia) technology, based on which gas based pl has been set-up in U.K. The innovative features of this p cess are:

* Gas heated primary reformer (GHR) wherein second reformed gas supplies heat for endothermic reformat duty,
* One stage isothermal shift converter (MT),
* Feed gas saturation with process condensate,
* Low S/C ratio in primary reformer operating at higher th conventional pressure and lower temperature, thereby sh ing more load to the secondary reformer,
* LP ammonia synthesis and
* All drives are electrical. One of the unique features is t complete elimination of HP waste heat boilers in front e (RG and CG boilers).

Capital investment for such small sized ammonia/ur complexes may not be very high where the sites are alrea developed and industrial infrastructure is available. Ener requirement, which is the part of the operational cost, is co parable to larger units.

METHANOL

Methanol technology entails production of syn gas (C and H_2) at front end through the steam reformation of na ural gas or naphtha or via coal gasification, similar to ra synthesis gas production for ammonia. Major difference li in the operating parameters of the primary reformer if na ural gas or naphtha is the feedstock. In synthesis gas pr duction the reformer is required to operate at comparative lower pressure and higher temperature. Distinguishing fe tures in available technologies are synthesis reactor desig synthesis loop layout, reaction heat removal system for LT LP methanol processes. Notable among these technologie are ICI, Lurgi and HTAS. The performance of low tempe ature copper based catalyst having high reactivity and goo methanol selectivity with resultant lower by-product forma tion (higher alcohol, aldehyde, ketones etc.) is quite attrac tive. The selectivity in methanol synthesis increases with lo pressure, low temperature, low CO/H and CO/CO ratios an high space velocity. Heat of reaction is removed in three di ferent ways in three categories of reactor configurations whic are integral parts of the offered technologies.

and the heat of reaction is removed by circulating
n generating high pressure steam. The reactor oper-
der nearly isothermal conditions having uniform reac-
perature profile. In quench type reactor, of ICI's
heat is removed by quenching with cooled gas at
l points of the catalyst beds. On the other hand multi-
ctors, in series are used with indirect cooling between
enerating LP/MP steam and BFW heating for HTAS
ic reactors. Crude methanol is purified by refining and
tion. In recent years, methanol has emerged as an
ant chemical intermediate for diverse applications with
vent of some revolutionary technologies.

ed urea is the most popular form of nitrogeneous fer-
as a source of 'N' nutrient. The reaction for the pro-
n of urea between ammonia and CO_2 takes place in
ges. In the first step, ammonia and CO_2 react to form
nium carbamate which is followed by dehydration of
ate in second stage to urea. The first reaction is exo-
c and goes to completion whereas, the second one is
ermic and, according to process condition, goes to
% completion. The reactor pressure is kept between
60 ata and the temperature between 170-200°C. The
ressure steam from the reactor is an extremely corro-
ixture of urea, water, carbamate, unreacted ammonia
CO_2. Final stages of processes are devoted to the
position of ammonium carbamate and recovery of
nia and CO_2 together with unreacted materials for
e at high pressure to reactor. Recycling of recovered
nia and CO_2 either separately or as carbamate solution
ves the overall conversion efficiency of ammonia to

h more efficient recovery of feedstock ammonia, it is
le to increase the molar ratio of NH_3 to CO_2 in the
r to achieve higher per pass conversion. The yield can
e improved by operating at higher synthesis temper-
which unfortunately increases the operating pressure
carbamate dissociation pressure increases with the tem-
re. Total recycle system recovers effectively, all feed-
not converted in reactor and recycles back to the
r as pure ammonia and concentrated carbamate solu-
n this system the usual practice is to carry out the car-
e decomposition and recirculation in two stage pressure
tion process (in MP and LP stage) followed by vacuum
ntration prior to prilling.

her energy consumption in decomposition and recyc-
f aqueous ammonium carbamate solution by pumping
h reactor pressure has led to the development of strip-
process where, the feedstock CH_4 or recycle NH_3 is
to carry out the decomposition at synthesis pressure

if its partial pressure is reduced by presence of NH_2 or CO_2. In the stripping process, urea synthesis, carbamate decomposition and condensation all take place at the reactor prossure. Heat of condensation is used to generate LP steam to meet the low level heat demand.

The conventional total recycle processes of Tecnimont, Stamicarbon and Mitsui Toatsu has been extensively used world-wide till early seventies. Subsequently, stripping processes of Stamicarbon and Snamprogetti have contributed larger shares of the capacity buildup. Further to conventional stripping process, improvements have been made in order to reduce the energy consumption (steam and power) leading to the latest low energy urea processes of IDR, ACES, UTI's heat recycle, Ammonia Casale SRR processes. Each of these processes incorporates features to minimise energy consumption and to improve the process effiency. Some of these have been successfully implemented as retrofit schemes in the existing units.

The improved heat recovery technique, associated with higher per pass conversion in the low energy process has reduced the MP steam consumption to about 0.6 te/te of urea which is a significant reduction compared to the first generation total recycle of the conventional stripping processes.

The low energy processes operate in the pressure range of 145 to 200 bar and at temperature range of 180-190°C. The NH_3/CO_2 mole ratio is maintained at 3.6 to 4.2 except for the Stamicarbon stripping process (2.95).

Due to the highly corrosive nature of the process stream, improved materials of construction have been developed for fabricating equipment like reactor, stripper tubes and HP condenser tubes. These materials are stainless steel with high chrome and low carbon content, Sandvik 2RE 69 and 3RE 60 urea grade, Titanium, Zirconium etc. Although prilled urea is the most popular and widely accepted fertilizer, there may be a trend for building granular urea plants in the country for specific applications and for superior agronomical efficiency. Technologies are available from TEC, NSM and Norsk Hydro for fluid bed granulation of urea.

The present article attempts only an overview of the recent trends in ammonia, urea and methanol process technologies. It should be remembered that no individual technology is versatile to suit all conditions. The merit of a given process must be judged under location specific conditions for the fulfilment of the overall project objectives.

PDIL with its long association with the growth of Indian fertilizer industry and knowledge about continuing advancements in technologies is fully equipped to play a pivotal role

International Petroleum Scenario

SAUDIS ACCELERATE OIL PRODUCTION

Saudi Arabia is accelerating its production expansion programme and is seriously and actively considering approving a plan which would raise the kingdon's sustainable crude production capacity to 10 million barrels a day by 1995, according to a report published in *Oil Daily*.

This plan, if approved, would be completed five years ahead of the original schedule for the 1990's expansion programme.

The new five-year plan would cost about $75 billion and would be the largest industrial project in the history of the oil industry, the report said.

At the same time, Saudi Arabia is reportedly getting ready to raise production up to 10 million BPD within six months, instead of the projected one-year plan to increase surge to the 10 million level.

Saudi Arabia, in the meantime, is reported to have brought surge capacity in the beginning of November to an 8.2 million BPD level having pledged at the OPEC meeting in Vienna in August to compensate world markets for the loss of Kuwaiti and Iraqi oil due to the United Nations sanctions.

The reason given for accelerating the surge programme upto ten million BPD in six months time is that the Saudis are expecting the Gulf crisis to persist for at least six months to possibly a year.

The Saudis are working round the clock to make the current production sustainable by de-mothballing facilities shut during the years of oil surplus in the 1980s. Saudi Aramco's $75 billion plan for a sustainable 10 million BPD struction of more gas-oil separating plants and water-injection facilities to maintain reservoir pressures contemplated in the original ten year plan, costing $35 billion.

The implications of the accelerated plan are that the Saudis apparently have decided to provide the world with all the oil they can produce not only for the duration of the crisis in the Gulf, but long into the foreseeable future, the report said.

If the Saudis indeed push regular output to 10 million barrels per day, it will be the first time since 1979 that the kingdom has reached this sustained level of production, the report said.

The projects on the cards include expansion and modernisation of existing fields, along with development of the Shaybah field abutting the border with United Arab Emirates. In addition there will be the new fields in the central region south of Riyadh, which various sources indicate will be developed from scratch at a level of $ one billion to $ 1.65 billion over the next 10 years.

One of the sidelights of the expansion programme is the Saudi decision to increase its crude export capacity at Yanbu by several hundred thousand BPD above the quantity previously budgeted in mid-1988.

The Saudis have recently budgeted $968 million for expansion of crude export facilities at Yanbu; up by $ 668 million from the $ 300 million budgeted in July 1988.

The Yanbu project is scheduled for completion at the end of 1992 and may be specifically designated to handle new amounts of the ultra-sweet central region production, which the Saudis are hoping to bring into world markets. In

and Mineral resources, Mr. Hisaham Nazer, announced the discovery of a gas condensate about 90 miles south of Riyadh in the central region.

The gas and condensates were of good quality, according to Nazer, with the gas free from hydrogen sulfide and no water in the condensate.

Recently, oil has been struck at Dilam, Raghib and Naeem after it was first discovered at Al-Hawtah in 1989. The high quality of the oil and gas finds in the central region has caused speculation that the new yield will be part of Saudi Arabia's accelerated five-year expansion programme.

The depth of the new discovery was 6,180 feet and the gas/condensate layer exceeded 220 feet in depth.

PETROLEUM ANALYSTS FORECAST WAR, 100 PER CENT HIKE IN CRUDE

Most energy analysts see the likelihood of war in the Gulf increasing daily, even as political leaders speak of a peaceful outcome to the crisis.

Analysts at major consultancy firms at Saloman Brothers, Hoare Govett, Duff and Phelps, Prudential Bache, Nomura and others indicate a conflict is inevitable, although their price forecasts are based on a continuing stalemate.

New York firms Saloman Brothers, Prudential Bache, and Nomura have predicted that 1990 last quarter prices will average US$27-US$30 for West Texas Intermediate crude, and US$28-US$29.50 for North Brent crude oil. However, C.J. Lawrence has forecast US$35 for West Texas Intermediate and US$34 for North Sea Brent in the last quarter 1990, and US$37 and US$38 respectively for 1991 first quarter.

The forecast for the 1991 first quar-

rmediate and US$28-US$40 for th Brent.

lowever, in case of war, the US ana- s have said that prices will go any- ere beyond US$40 a barrel. Nomura further added that crude will sell for $70 a barrel if Saudi Arabia is acked.

London based firms Hoare Govett, ilips and Drew and Smith Newcourt ve predicted an average US$32.50- S$34 per barrel for West Texas Inter- ediate in the 1990 last quarter, and S$31-US$34 for North Sea Brent. In e 1991 first quarter this is expected go up to US$30-US$31 for both ades.

However, in case of war crude will verage US$40-US$50 they have said. he war-stipulated forcasts seem a little estrained however, as most analysts lso addended that if war breaks out, the sky is the limit."

OIL PRICE RISE: GAINS FOR MALAYSIA

The Malaysian economy is well insu- ated against the negative effects of a Gulf war and stands to gain from the rising oil prices.

Malaysia is in a far better position than many other countries and as a net exporter of crude oil, will stand to earn more revenue from the increase in petroleum prices.

According to the Finance Minister, Mr. Paduka Daim Zainuddin, the worst that would happen if the price of oil went beyond the $60 a barrel is a little less growth and a little more inflation. Malaysia, he said, would use the extra revenue it is earning from the increse in oil prices for development and to repay the country's debts.

Among the six countries in the Asso- ciation of South East Asian Nations and Brunei have rich oil resources. Singapore, Thailand and the Philippines depend on imports to meet their requirements.

For Indonesia, the soaring oil prices have come as a boon. In fact, policy planners are still undecided as to what to do with the windfall from higher oil revenue without giving rise to inflationary pressures.

Indonesia, which is a member of the organisation of Petroleum Exporting Countries, is facing an adverse balance of payments problem which is expected to be offset with the increase in oil revenue. Indonesia's future, however, lies in non-oil exports, according to an official in Jakarta.

Some of the proposals under consideration are that the extra revenue be used to pay off more than $50 billion in debt and spending the money to uplift living standards in the Eastern Provinces. But, with inflation currently at 9.14 per cent, the Government is worried that spending the extra revenue from oil would only boost inflation further.

The high cost of fuel has, however, hit Asia's international airlines hardest cutting into their revenues. With rising fuel bills, most of the airlines have reported a steep fall in their profits.

A SUBSTITUTE FOR DIESEL?

Can *jatropha curcas* (euphorbiacaea) oil, known in India as moglaerand, baghierand, chandrajyoti, chandraprabha or nepalam, be a substitute for diesel?

If analysis by petroleum consultants of Thailand is any indication the *jatropha* curcas oil could positively replace diesel, the former Maharashtra Minister, Mr. Vinayakrao Patil, said at an all-India seminar on "Modern techniques of rainwater harvesting, water conservation and artificial recharge" held at Pune on November 19.

A "kubota" four-stroke cycle diesel engine (seven HP/2200 rpm, with a simple horizonal piston, a cylinder volume of 400 cc, and a water cooling system) and a "yanmar" diesel engine (horizonal four cycle, seven HP/2400 rpm of precombustion type) usually run on liquefied petroleum gas (LPG) and diesel respectively, were tested for comparative performance against running on jatropha oil.

The results showed that engine performance and fuel consumption were favourable and the inspection of kubota diesel engine parts, when run on jatropha oil for 1,000 hours, were also satisfactory, Mr. Patil said after presenting his paper at the conference.

Mr. Patil said when compared with diesel oil for exhaust gas tests, the differences in smoke and carbon monoxide content were not only negligible but the values were also lower than the accepted values as per the standard specifications of the Environment Board.

Further, no sulphur dioxide was found in the exhaust gas of the diesel engine run on jatropha oil, as against 125 ppm sulphur dioxide found in the exhaust gas of the diesel engine run on diesel oil.

Mr. Patil said *jatropha curcas*, adapted to arid and semi-arid conditions, has low fertility and moisture demand and can come up on stony, gravelly or shallow and even calcareous soil. It can be propagated from seeds as well as cuttings.

He said 1,500 litres of oil could be extracted from the yield per acre of 5,000 kg. of *jatropha curcas* in irrigated areas and 400 litres oil from 2,000 kg. yield per acre in unirrigated areas.

Stating that the country imports jatropha oil worth about Rs. 400 crores annually, Mr. Patil felt that cultivation of jatropha should be taken up on a massive scale all over the country.

NATURAL GAS AS FERTILISER

It has been noted with concern that the flaring of 40 per cent of India's annual output of natural gas constitutes a colossal waste. What has gone unreported is an as yet unexploited property of the resource, that magnifies the proportion of the loss.

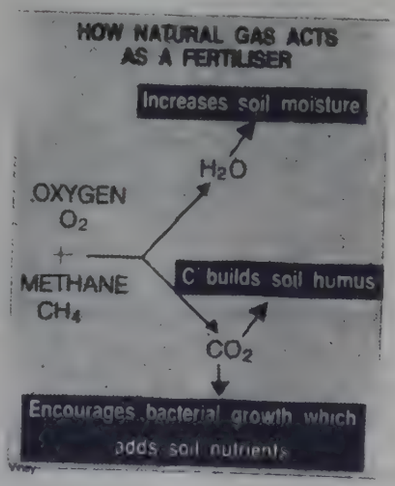
The property is the ability of natural gas to directly improve soil fertility —by being injected into the soil as it is, without a conversion process. This potential function as a natural fertiliser could be a boon for a country like India where the need for expanding food production is putting severe pressure on land and demanding ever increasing inputs of irrigation water and chemical fertilisers.

The credit for discovering this property goes to a German geologist, Werner Ernst. He noticed that, in the vicinity of certain oilfields, green wheat fields would often be interspersed with golden bands of ripe wheat. This led the geologist to think that the boost given to the vegetation causing it to ripen early, must have come from something in the earth's interior. He suspected natural gas to be the benefactor and started investigating its effects on soil fertility.

The mechanism of fertiliser action rests on methane, the major constituent of natural gas. Methane is a simple hydrocarbon with the formula CH_4. Experimental work has shown that the presence of even small amounts of methane in the soil functions as a catalyst for soil bacteria. Methane decomposes to carbon dioxide and water. This chemical reaction being exothermic, heat is also released. Carbon dioxide is a food source for bacteria.

The increase in soil temperature increases the rate of bacterial activity in the soil, leading to faster and more growth. As a result of higher metabolic activity, soil bacteria release increased amounts of metabolics containing calcium, magnesium, phosphorus and potassium into the soil, thus adding nutrients to it. Results from Ernst's longitudinal studies have shown that the concentration of some nutrients like phosphorus remain high in the soil even a year after gas treatment.

The water produced from the oxidation of methane adds valuable moisture to the soil, facilitating seed germination. Over time, the concentration of carbon in the soil will aid the build up of humus, further stabilising soil quality. In India where the pressure on land is immense, where there are large, arid and semi-arid regions and where, according to experts, a water famine is just round the corner, the use of natural gas to upgrade marginal soils assumes a special significance. Not only that, in regions where agriculture is fertiliser and water-intensive, natural gas treatment could reduce the requirements of irrigation water and fertilisers.



Prolonged and excessive use of chemical fertilisers is degrading thousands of hectares of prime agricultural land. Moreover, the synthesis of chemical fertilisers is energy intensive and highly polluting. The industry generates large volumes of dangerous toxic wastes which are leaching through the soil and contaminating ground water.

The modalities of actually using the gas need not be complex. The gas could be tapped from the major pipeline such as the HBJ pipeline today and others when they come up, filled into vats or drums and taken to the fields. There it could be injected into the soil at a depth of half a meter or so. This should give the gas enough space to diffuse in a reasonably large area. Experiments have shown that under normal soil conditions, a single injection of gas spreads into a roughly 200 meter long zone. Trials could optimise the manner of delivery so as to minimise waste. For India, this simple technological intervention could mean improving the vegetation-carrying capacity of soils without paying the price of land degradation and environmental pollution and at the same time conserve foreign exchange.

SEMINAR ON SURFACE COATINGS FOR THE 90'S

The Colour Society has announced a one day seminar on the topic "SURFACE COATINGS FOR THE '90s" to be held in Bombay on December 15, 1990. The seminar is expected to give important information for utilisation of indigenous resources, development of indigenous know-how for paint, printing ink and allied industries. The seminar will be attended by chemists and technologists in the surface coating industries and provide a unique opportunity to all concerned with the industry to exchange their ideas and views. The information disseminated during the seminar from eminent technologists and industry experts, who will share their expertise and views on topics including pigments, binders, resins, solvents, machinery, colour matching techniques etc. will be of immense value to the coating industry.

Dr. R.J. Rathi, Managing Director of Sudarshan Chem. Inds. Ltd., Pune has kindly consented to be the Chief Guest and grace the occasion.

For further details contact The Colour Society, C/o. Dr. A.V. Pradhan, Secretary, Seminar Committee, PPV Section, U.D.C.T., N.M. Parekh Marg, Matunga, Bombay-400 019. Ph. 4114306

International Technology Update

TERGENT MANUFACTURERS AUNCH COMPACTS IN U.S.

Procter & Gamble has taken the lead d launched, superconcentrated powd- s or "Compacts" of their four best- lling powders in the U.S. Introduced Japan, around three years ago, these rmulations now account for some 0% of the powder market. Convenience and performance are listed as ajor reasons for their quick acceptability, although environmental concerns he compacts require less packaging) ay also work in their favour.

There have been earlier launches of ompacts, in the U.S., most significantly y Colgate-Palmolive, but P&G's entry narks a major thrust into this segment f the $ 3.8 billion U.S. market.

ARCO RENEWS COMMITMENT TO TECHNOLOGY DEVELOPMENT

Arco Chemical (U.S.A.) has reaffirmed its commitment to a $ 2.5 billion worldwide investment program despite the current economic slowdown.

The company will continue efforts to develop low-cost technologies for MTBE, which does not yield any coproducts; develop low-cost hydrogen peroxide technology; and develop high value-added speciality derivatives such as super-absorbent, tert-butyl alcohol-based fibres.

UNCRITICAL USE OF PESTICIDES HARMFUL

The uncritical use of pesticides in the wake of the green revolution in many Asian countries has upset an ecological balance, claims a development economist specialising in the affairs of United Nations.

Writing in the UN journal *Development Forum*, Mr. Ian Steele contends that though the green revolution brought spectacular gains in yields, the role of pesticides in the equation was greatly 'oversold'.

According to him, the most dramatic evidence of this was recorded in Indonesia where the rice brown planthopper — a minor pest before the green revolution — infested rice crops in Java and North Sumatra in 1976-77. In a bid to control the outbreak, the aircraft blanketed more than one million rice fields with pesticides, but to no avail.

Mr. Steele says the lesson out of this Indonesian experience is that pesticides combined uncritically with fertilisers was in fact 'a recipe' for brown planthopper.

Quoting an entomologist with the Integrated Pest Management (IPM) programme in Indonesia, Mr. Steele says there are normally several hundred species of insects in a rice field, and that for every pest there are many more insects which help the farmer.

They are natural predators which do not damage the rice but feed on the pests which do damage to the crop. Unfortunately, imported pesticides — some of which were developed two decades ago for crops other than rice and for pests in other regions of the world — make no distinction between pests and insects that are 'farmers' friends'. These imported pesticides kill 'indiscriminately'.

Mr. Steele claims that experts on IPM from the UN Food and Agriculture Organisation (FAO) now say that 15 years of data gleaned by the International Rice Research Institute and its collaborating networks in Asia demonstrate no positive yield response to insecticides. Following a renewed bout of brown planthopper outbreak in Indonesia, the country tried a new approach by quickly cutting subsidies on pesticides and banning many products from use in the rice fields.

NEW ANTI-AIDS AGENT FOUND

Gossypol, a substance extracted from cotton seeds now being tested as a possible male contraceptive, can also prevent the AIDS-causing Human Immunodefficiency Virus (HIV). Encouraging results have been obtained in trials conducted in Mexico, Finland and the US on its use in preventing viral infections.

This major finding, which will add another dimension to the ongoing research on prevention and cure of the dreaded disease, was reported for the first time at a meeting of scientists from third world countries which began at the National Institute of Immunology, New Delhi.

The substance, used with certain other ingredients as a Protective Vaginal Cream (PVC), kills sperms, and other viruses including the HIV. PVC can not only protect women against AIDS, but can also guard them against pregnancy.

The findings of the study were reported by Mexican scientists attending the South-South Collaborative Programme on Population Sciences and Reproductive Health, funded by the Rockfeller Foundation.

The use of gossypol as an anti-viral agent has been prevalent in the USSR for the past 30-40 years, but was scientifically confirmed for the first time in Mexico. The trials are now being pursued as part of the South-South Programme.

Dr. Sheldon Segal, who heads the population division at the Foundation, said that gossypol can be used both as a PVC as well as a male pill. Gossypol first captured the attention of the

scientific community in the 70s when the Chinese reported its anti-fertility action. The discovery itself was incidental. High incidence of male infertility was reported in areas where people consumed cotton seed oil. This led to studies which pointed out that the gossypol found in cotton seeds was responsible.

Subsequently, other countries got interested and the World Health Organisation also initiated a programme to study its efficiency as a male pill. Advanced stage trials are now on in several countries including India. The Indian trials are being conducted by the Post Graduate Institute, Chandigarh and the University of Jaipur. Results of these trials all over have been encouraging.

Reversibility and safety are the two aspects that need to be tackled before gossypol can hit the market. A major side effect reported is the incidence of hyperkelaemia or lowering of potassium levels in blood.

Dr. Segal said India's leadership in contraceptive development was unchallenged and other third world countries could benefit greatly from the experience. National Institute of Immunology Director, G.P. Talwar said that the programme was a unique initiative, which involved the participation of 16 scientists from 11 countries. The group meets every six months in one of the particpating countries to discuss the progress achieved.

The aim was to find contraceptive methods which are acceptable to people in third world countries and which suited the socio-cultural environment of these countries.

SINGAPORE BANS CFC PRODUCTS

Singapore has banned the imports and manufacturing of aerosol products containing chlorofluorocarbons (CFC) which destroys the ozone layer protecting the earth from ultra-violet rays.

Minister of environment, Ahmad Matter, announced the ban will be effective from February 5, 1991.

He said the imports and manufacturing of polysterene sheets or products using CFC will also be banned as of that date in order to reduce the consumption of CFC in fields where substitutes are already available.

PRO-ENVIRONMENTAL BINDING AGENTS, PIGMENTS AND AUXILIARY AGENTS FOR PAINTS, PRINTING INKS AND TONERS

As a supplier to the paints and colours industry Degussa AG of Frankfurt am Main, has announced various new developments which have joined its product range since the 1989 Resins & Pigment Exhibition. The emphasis is on pro-environmental water-based binding agents.

The product range comprises aqueous pure acrylate dispersions (brand name Degalex®), thermoplastic methacrylate resins (brand name Degalan®), cationic UV-hardened epoxy resins (brand name Degacure®), coloured carbon blacks, fumed silicas and matting agents for paints, printing inks and toners.

Aqueous, isocyanate cross-linking acrylate dispersion

Degalex® VP-BF 150 was developed as a binding agent for the formulation of highly block-resistant dispersion gloss paints and wood paints for the d it-yourself market.

The emphasis is on the new dispe sion Degalex® VP-BF 250, who characteristics -- it is aqueous and is cyanate cross-linking -- entirely satis the requirements for wood paints. Th advantages of this dispersion includ its outstanding chemical stabilit Degussa can supply samples of ready formulated dispersion paints on reques

Degalex® VP-EM 210, an aqueou acrylate/alkyd emulsion, is used specif ically in the manufacture of solvent-free aqueous, block resistant wood stains fo use outdoors. Degacure® is a cationi UV-hardened epoxy resin intended spe cifically for use in the packing industry

Brighter delivery prospects for matting agents

The product range includes the universal matting agents OK 500 and TS 100 (suitable for water-diluted paints), for which the delivery situation is expected to improve by the start of next year. The Degussa range also includes the hydrophobic Aerosil® grades R-972, R-805, R-974 and R-812, and toner resins on a basis of styrene/acrylate resins for the manufacture of power toners.

The special black 100, the conductive blacks Printex® XE 2, L and L 6 and VOSSEN® blue are supplied to the paints industry. For the printing inks industry the various Printex® qualities and VOSSEN® blue are offered.

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Have you sent in your renewal payment/instructions in respect of your subscription for the year 1991? If not, do it so immediately.

News from Japan

AN'S R&D CAPABILITY OWS MARKEDLY: GOVT. ORT SAYS

pan is outpacing major European tries in terms of R&D capabilities; has yet to catch up with the United es with regard to R&D scale but is ost equal to that country when it es to R&D results on a per capita s. This was revealed in the research lts obtained by Institute for Future hnology at the request of the Science Technology Agency.

The United States' advantage over an and Europe has relatively lined, while Japan has conspicuously lt up her R&D capacity, says the ort concerned. With regard to Asian ntries, S. Korea and Thailand have gressively introduced industrial tech- logy and scientifc knowledge.

Private S. Korean businesses have come able to push ahead with inde- ndent R&D work by themselves. In ailand, however, the government eds to establish a firm foundation for &D activities since the private sector s no ability to do so.

The survey concerned was conducted y analyzing related statistics, referring data bases covering treatises and olding hearings soliciting views of xperts living in each country.

APAN'S OIL RESERVES RISE TO 21.5 MIL. BBLS IN AUGUST

Japan's crude oil reserves at the end f August amounted to 521.50 million bls, up 2.26 million bbls from late July, fficials at the Ministry of International rade and Industry (MITI) said.

Total oil reserves in both the private nd public sectors amounted to 142 lay's supply, the officials said. The dditional oil reserve of 2.26 million bls would last Japan just under 15 hours. This country's daily consumption is 3.65 million bbls.

Oil reserves in the private sector at the end of August came to 324.25 million bbls, while those held by the government totaled 197.25 million bbls, according to the officials. All of the 2.26 million bbls added to Japan's oil reserves went to the stockpile in the private sector, they said.

The current Middle East crisis has no influence on the oil supply in August since the tankers that arrived in Japan during the month had been loaded and left ports in July. The increase in oil reserves in August was larger than the government's original target of a 1.38 million-bbl rise.

HONSHU CHEMICAL TO CULTIVATE BLOCKBUSTER PRODUCT

At the central element in its medium-term restructuring plan, Honshu Chemical Industry Co. will build up its self formulated bisphenol, a basic material for super engineering plastics and liquid-crystal polymers, into a major specialty chemical product.

The company has recently completed and brought on-line a multipurpose, 3,000-ton-per-year-capacity plant at its Wakayama factory, and will take this opportunity to expand markets for the product both at home and overseas.

While the present market for liquid-crystal polymers is relatively small, it is growing at an annual rate of 50-100%. Honshu Chemical plans to raise operational efficiency by co-producing special bisphenol products and thereby meet this growing market with high quality, low-cost products.

When Honshu transferred business operations of mainstay product bisphenol-A to parent-company Mitsui Petrochemical Industries Ltd., it used the occasion to begin realigning operations under a set schedule.

This year marks the second year of the schedule. Since last year, Honshu has been commercializing a stream of products, including resin additives, surface quality reforming agent, and binding agent raw material on consigned production from Mitsui Petrochemical.

The company built and brought on-line last fall, a plant for producing agro-chemical intermediates and amino chemicals, a move which helped place its business restructuring plan squarely on track.

The company had been studying the proper timing for launching its self developed bisphenol, a derivative of 2,6 di-tert-butylphenol. Contained in the new plant are multi-purpose facilities for producing this and similarly structured chemical products, including special types of bisphenol.

Bisphenol is a basic material used to produce liquid-crystal polymers (LCP). LCPs boast of higher strength and heat resistance than other engineering plastics, and because they hold promise for electronics and precision component applications, demand is expected to increase year by year.

Honshu Chemical and one U.S. firm have exclusive rights to the LCP raw material. Honshu plans to capitalize on this advantage by cultivating business in both domestic and overseas markets.

The company has already received a number of product inquiries from abroad, and will employ Mitsui & Co.'s overseas networks to help achieve its objectives.

MITSUBISHI RAYON, ASAHI KASEI CARBON FIBER LIKELY TO EXPAND IN PAN CARBON FIBER

In the field of PAN carbon-fiber production, attention is being focused on

the expansion of production facilities by two middle-standing manufacturers —Mitsubishi Rayon and Asahi Kasei Carbon Fiber Co. In this field, two top-ranking manufacturers — Tory Industries and Toho Rayon — had established systems for an annual production of more than 2,000 tons each by this summer. As a result, the gulf between these two manufacturers and the two middle-standing companies, which have an annual production capacity of approximately 500 tons in each case, has widened. Furthermore, Toray Industries and Toho Rayon are strengthening their marketing activities, with the effects produced by the reduction of costs through mass production in the background.

Consequently, it has become necessary for the two middle-standing companies to take countermeasures. Both companies recognize the necessity of expanding production facilities. However, it is somewhat difficult for them to make a final decision, because of such factors as dwindling demand in the United States due to the easing of cold-war tension and the trend of the situation in the Middle East.

During the past one or two years there has been a world-wide rush for expansion of PAN carbon-fiber production facilities. Last year Mitsubishi Rayon expanded production facilities from 120 tons to 500 tons, and Asahi Kasei Carbon Fiber from 350 tons to 450 tons. After the start of this year, Toray Industries and Toho Rayon, which are world-class top-ranking manufacturers, started facilities expansion, for switchover to a system for production of 2,250 tons and that of 2,050 tons, respectively.

As a result, the combined production capacity of Toray Industries and Toho Rayon has become more than four times as large as that of Mitsubishi Rayon and Asahi Kasei Carbon Fiber. Also, both Toray Industries and Toho Rayon aim at securing a share of 30 to 40% in the world's PAN carbon-fiber market by means of facilities expansion. Since this summer competition for markets between the two companies has stiffened.

Competition between these two companies is particularly fierce in the case of products being manufactured in ROK and Taiwan for sports and leisure uses. Price competition, too, is developing, with cost reduction via mass production in the background. Price competition is spreading to the PAN carbon-fiber market as a whole, making it necessary for both Mitsubishi Rayon and Asahi Kasei Carbon Fiber to take some countermeasures.

A source concerned has pointed out that "The price has fallen by about 15% on a dollar basis in comparison with the level of the previous year". Because of these circumstances, both companies think that it is very necessary for them to establish a system for production of more than 1,000 tons each and cut costs through mass production.

ASAHI GLASS TO STEP UP SALES OF NONMERCURY PROCESS ABROAD

Asahi Glass Co. has set itself to building in the United States and Europe marketing bases for an inhouse-developed ion-exchange membrane (IM) process for electrolytic soda production. The mercury process is still widely used in electrolytic soda plants in the U.S. and Europe but there are active moves towards switching it to the IM process, keeping pace with toughened pollution controls. Solvay (Belgium) — Europe's largest chlor-alkali maker — plans to switch the mercury process to the IM process and has signed a contract to introduce it from Asahi Glass.

This move may encourage process conversion in Europe's electrolytic soda industry. In Japan, the mercury process has been completely switched to non-mercury processes and the IM process accounts for 79% of Japan's combin electrolytic soda production.

In Europe, however, the mercury pr cess occupies 65% of total electrolyt soda production (12.5 million t/y) whi the corresponding figure for the IM pr cess is only 6%. In North America, th IM process accounts for 6% of tot production; the mercury process, 18% and the diaphragm process, 76%.

NIPPON MINING TO BOOST OI BUSINESS IN SINGAPORE

Nippon Mining Co. has establishe a wholly owned subsidiary, Nikk Petroleum (Asia), in Singapore with th aim of procuring raw-material oil an oil products in Southeast Asia and mar keting lubricants and petrochemical products there.

The company has hitherto pushed forward oil operations abroad on the strength of its two business footholds, one located in Britain and the other, in the United States. Demand for lubricants and petrochemical products is rapidly growing in Southeast Asia along with promotion of industrialization and the economic progress in the region.

Establishment of the new subsidiary will help Nippon Mining grasp the business opportunities in Southeast Asia, particularly in Singapore serving as a center for oil trade.

Nippon Mining established in 1979 Nippon Mining Singapore, which has attained good sales of rolled-copper products but is not suitable for oil trading.

MITI TO HELP FOREIGN FIRMS START UP BUSINESS IN JAPAN

MITI has set itself to establishing next fiscal year International Information Center for Subcontract Business (tentative name) within All Japan Subcontractors Association. It has asked for

The planned information center introduce local subcontractors to seas enterprises who are scheduled naugurate business operations in n. The project is aimed at giving port to such foreign firms and help- domestic subcontractors diversify r business partners and thus build up r corporate structure.

Subcontractors' Association estab- ed in each prefecture currently ves as a go-between for local sub- ntractors and overseas companies ng to break into the Japanese market. e information center is due to super- e such work. It will make a list of ocontractors classified by type of dustry and compile a pamphlet cov- ng Japanese business practices.

PLASTIC ASSOCIATIONS ORKING TOGETHER FOR ASTE TREATMENT

Twenty-six associations involved in astic products in Japan have formed, nder the leadership of the Ministry of ternational Trade and Industry (MITI), liaison conference to discuss problems ith regard to disposal and reclamation f waste plastics and decide on appropate measures to be taken by Japanese lastic makers.

The conference has already held its irst meeting at which members decided o launch 10 subcommittees to discuss ssues related to 10 categories are: PVC, oamed polystyrene, PET bottles, FRP, olyolefin films, polyolefin bottles and ood containers, foamed construction naterials, daily necessities, industrial- se injection-molding products, and ndustrial-use resins.

The subcommittees are hurying to discuss and examine their particular issues so that they can present interim reports to MITI. Ultimately the confer- ence will compile the study results of the subcommittees and work out a draft for a guideline for the plastic industry with regard to disposal and reclamation of waste plastic products. The draft will then be presented to Industrial Structure Council, an advisory body to MITI.

Waste plastics produced in Japan have been rising year by year, reaching 4.8-5 million tons a year. Although the majority of them have been recycled or reclaimed, the amount of waste plastics which have not been used again has also been increasing and this poses a social problem.

CROSSOVER RESEARCH AIMED AT DEVELOPING NEW MATERIALS

The Agency of Industrial Science and Technology is scheduled to inaugurate next fiscal year a 3-year project aimed at pioneering two types of new materials through crossover research work. A crossover research system was put into force this fiscal year with the aim of promoting in earnest co-operative research tackled by research organs added to the agency.

In the said project, three government industrial research institutes located in Osaka, Nagoya and Kyushu are due to jointly tackle "research on fiber-reinforced ceramics used at high temperature". They will strive to overcome the fragility of ceramics by developing basic technology for production and structural analysis of targeted products.

In more concrete terms, they will try to combine ceramics with organic silicone polymer and high temperature-resistant oxide whiskers and improve the mechanical properties of ceramics using an ionic-engineering method.

On the other hand, three other research bodies — Research Institute for Polymers and Textiles, Industrial Products Research Institute and National Chemical Laboratory for Industry —are expected to jointly conduct "research on method for structural control and assessment of amorphous macromolecular material". They will aim to elucidate the relationship between the structure and physical properties of the targeted material and develop technology for controlling the amorphous structure concerned. The research is finally intended to apply organic macromolecular glass with an amorphous structure to optical communications devices.

Three biotechnology-related themes are now being tackled in accordance with the crossover research system.

ASAHI CHEMICAL 60,000-T/Y CYCLOHEXANOL PLANT STARTS UP

The cyclohexanol plant of Asahi Chemical Industry Co., which has been under construction at the site of the Mizushima Plant of this company and which uses the cyclohexene process and has an annual production capacity of 60,000 tons, has been completed and has gone into operation on a commercial basis.

Like the existing plants, the new plant uses benzene as starting material. However, it uses a new process unknown to the world until now. By this process, benzene is turned into cyclohexene by the partial addition of hydrogen and then into cyclohexanol by hydration.

Asahi Chemical Industry Co. is turning out Nylon 66 at Nobeoka, with AH salt as material. AH salt is made from hexamethylenediamine and adipic acid. Adipic acid uses benzene as starting material. Benzene is turned into cyclohexene by the addition of hydrogen. By air oxidation, cyclohexene is turned into KA-oil a mixture of cyclohexanone and cyclohexanol.

KA-oil is then turned into adipic acid by oxidation, with the use of nitric acid.

Production of KA-oil is going on as a joint enterprise with Sumitomo Chemical. However, the price of KA-oil has been fluctuating drastically because the

shortage of supply at home has been covered by imports. In addition, there is a problem of quality, and supply has been unstable. Because of such a situation, Asahi Chemical Industry Co. has been pushing the construction of a plant using a new process, with a view to strengthening the competitiveness of products via complete self-sufficiency in raw materials. This company has attained its targets of increasing efficiency as well as of establishing a new process for adiponitrile production.

The new process is characterized by a carbon-absorption ratio of nearly 100 per cent. The by-product cyclohexane can be used effectively. The amount of hydrogen used is only two-thirds of that used with the existing formula. So, competitiveness with respect to cost is excellent. Also, the new process produces very little in the way of by-products which are created at the rate of a little more than 20 per cent in the case of the existing formula. So, the new process is excellent with regard to environmental protection and safety.

TOWA CHEMICAL STEPPING UP MALTITOL BUSINESS OVERSEAS

Towa Chemical Industry Co. has rapidly grown as an all-round producer of sugar alcohol. The company has recently been intent on exploiting domestic/overseas demand for "Amalty" maltitol. Amalty is sugar alcohol developed by the company itself: it is produced through hydrogenation of high-purity maltose, which is obtained from raw material starch. The related production method has seen rapid progress since 1962 when Amalty syrup was developed. The company succeeded in 1981 in commercializing crystallized Amalty.

The quality of Amalty's sweetness is close to that of sugar and its degree is about 70-90 per cent that of sugar. The product does not raise the blood-su value and, as a low-calorie produc hardly absorbed/digested in the hun body. It has been used in a wide va ety of foods in Japan and Europe. It registered with the U.S. Food and D Administration in 1986.

Amalty is less hygroscopic than s bitol, easily shaped into a targeted fo as in the case with sugar, decays te less and is capable of substituting for and fats. Due to these advantages, product has been extensively used many fields. For example, it is used hard candies, chocolate, tablets, che ing gum, baked goods and as table-t sweetener. The product has recen come to be widely utilized as ba material for sugarless coating on foo and drug tablets. Amalty-applied co ings are usually classified into two typ — soft and hard. The said coating h a smooth surface when produced fro slurry containing 60-80% of sol ingredient (Amalty).

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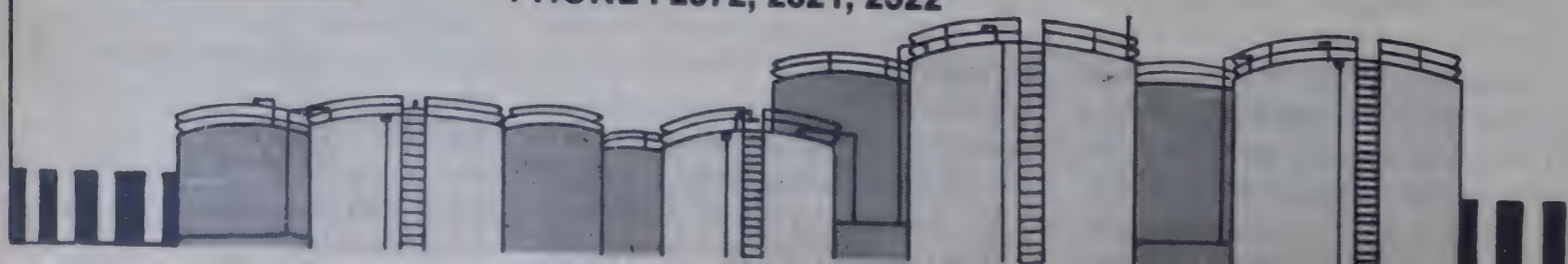


New Developments from Japan

RARAY ESTABLISHES SYN-ESIS PROCESSES FOR THREE RFUMES

Kuraray Co. has succeeded in synthe-ing three types of perfumes — irone, usk and ambergris: the natural pro-cts concerned are increasingly diffi-lt to obtain, while it has hitherto been garded difficult to broaden application elds for the related synthetic products nce their market prices are compara-vely high and raw-material supplies re limited.

Little natural irone appears on the narket since it is extracted from the iris oot only at a poor rate. α -Isomer-rich rone has been synthesized and mar-keted but is as expensive as ¥ 200,000/kg and the world's demand for he product stands at only one ton a year.

Kuraray claims that its synthetic irone — also an α isomer-rich product — can be marketed below ¥10,000/kg since the company is able to self-supply starting material isovaleral, thereby reducing production cost.

The synthetic product is incompar-ably superior to ionone in fragrance intensity and retention effect: irone is used as a violet perfume, while ionone has hitherto been employed as a substi-tute for violet perfume.

It has recently become difficult to obtain natural musk, which has been, therefore, replaced by iso-chroman and tetraline. Tetraline has been commer-cialized by a few firms throughout the world but supply of the raw-material neohexene required is unsteady.

Kuraray synthesizes the product using an original process employing no neohexene and the synthetic product is highly price competitive.

It has also been difficult to obtain natural ambergris from sperm whale calculus along with enforcement of the ban on whaling. As a result, sclareol extracted from tobacco leaves has been employed as a dominant ambergris sub-stitute but its raw-material supply and market price have yet to reach satisfac-tory levels.

Kuraray has reduced production cost for synthetic ambergris using a through-production system employing self-produced raw material. The synthe-tic product shows an excellent retention effect.

TOYOBO TO FINISH CLINICAL TESTS ON NEW-TYPE ANTI-ANGINAL AGENT

Toyobo Co., a leading Japanese tex-tile maker, has revealed its intention of commercializing its inhouse-developed new-type anti-anginal agent to be absorbed through the oral mucous membrane, in partnership with Kodama Ltd., a specialty drug maker and sup-plier.

Toyobo will finish phase-III clinical tests on the agent within this year and plans to apply for manufacturing approval for it around next spring. It will be the third Toyobo agent to gain gov-ernment approval, following a tissue plasminogen activator (TPA) and erythropoietin-growth activator (EGA).

Kodama is good at cardiovascular agent business and has established its own sales network among medical prac-titioners who will use the new agent.

"TYB-3215" agent is a buccal whose effective ingredient is immedi-ately taken into the blood via the oral mucous membrane without going through the liver and thus has no side effect on the liver as conventional oral agents have. It is the results of success-ful R&D on a drug delivery system.

The company has tied up with Dai-ichi Pharmaceutical Co. on sales of its TPA and with Hoechst Japan, on its EGA.

NEW BIOREACTOR UPS TRI-GLYCERIDE CONTENT IN PALM OIL

Ajinomoto Co. — together with Amano Pharmaceutical Co. and JGC Corp. — has pioneered a new bioreac-tor system designed to produce triglyc-eride (TG)-rich oil and fats for edible use. The production system is aimed at upgrading palm oil by making lipase work on crude palm oil, thereby raising the TG content to approximately 95%.

Palm oil — an inexpensive raw material for oil and fats — is produced mainly in Malaysia and Indonesia in large quantities (10 million t/y). TG con-tained therein is employed as confec-tionery material but is hydrolyzed to a certain degree when the palm oil itself is extracted from palm kernels. TG is decomposed into diglyceride (DG), which deteriorates the crystalline struc-ture and thermal stability of refined palm oil. When crude palm oil is refined, the TG content concerned drops to 87%, while DG remains in the refined product at a high ration.

The bioreactor system is capable of transforming DG and fatty acids — both contained in crude palm oil — into TG using enzymatic catalysts. To this end, pseudomonas-derived lipase P is com-bined with lecithin — which serves to enhance the enzyme's activity — and the resultant product is fixed on a sel-lite carrier.

The system is capable of synthesiz-ing TG at the rate of 500ml/h. Palm oi thereby modified contains less DG and crystallizes faster than the equivalen produced using a conventional method In addition, it has higher-level safety. I has been confirmed that the system i capable of suppling high-quality pro ducts after about two weeks of contin uous operation.

TITANOCENE DIAZIDE SYNTHESIZED; USABLE AS TIN FILM MATERIAL

NTT LSI Laboratories has found that titanocene diazede — $Cp_2 Ti(N_{3)2}$ — is usable as raw material for titanium-nitride film produced through chemical vapor deposition (CVD) — and Tri-chemical Laboratory has established on the basis of this finding a new process to synthesize the product (purity: over 99.99%) by modifying existing technology. Titanium-nitride film is employed as barrier metal for contact holes formed on multilayer printed circuit boards.

In the new process, $Cp_2 TiCl_2$ is used as a substrate, NaN_3 as a reactive reagent and acetone and toluene as reactive solvents. NaN_3 — classified as azide — is thermally stable and can easily be obtained in large quantity. The NaN_3 available on the market contains 3-4% of water and alcohol as stabilizers. The product is dried at 90°C for 24 hours under reduced pressure. Crude titanocene diazide is produced from all these products: it contains nitrogen at a ratio almost equivalent to the theoretical level.

The crude product is re-crystallized using a heptane/butane solvent and titanocene diazide with a purity of more than 99.999% is produced therefrom. In addition, it is refined by means of a sublimation process. To date titanium tetrachloride and tetradimethyl amino-titanium has been employed as raw material for thin CVD film of titanium nitride. They call for addition of reactive gas (NH_3 and hydrazine) as a nitrogen source. The above mentioned new process is capable of producing highpurity titanocene diazide without the reactive gas.

NEW DEINKING AGENT MAKES RECYCLED PAPER WHITER

Harima Chemicals, Inc. has pioneered "Haritop-10" deinking agent for used paper: it is applied to a deinking-pulp (DIP) process based on the flocculation-type floatation method.The new product is more effective in making recycled paper whiter than are conventional products. It is produced by adding ethylene oxide to a derivative of tall-acid fatty acid obtained from crude tall oil. Tall-acid fatty acid contains little saturated fatty acid linolenic acid and has a low cloud point.

The new agent is used in combination with other agents including a foaming agent. All of them are now being tested by major dometic paper manufacturers. The company is scheduled to immediately start marketing the product in expectation of successive introduction of DIP equipment by paper producers. It expects annual sales of the new product to reach ¥300 million two years hence.

In response to a sharp increase in demand for fatty-acid derivatives, the company plans to complete a reactor (capacity: 9 m^3 by the end of this year). The reactor will give impetus to deinking-agent operations. The company is an all-round producer of paper chemicals including paper fortifiers and sizing, defoaming and paper-strengthening agents etc.

NIPPON YAKIN TO LAUNCH INTO METAL-HONEYCOMB BUSINESS

Nippon Yakin Kogyo Co. plans to start — during this year or early next at latest — mass-producing an inhouse-developed metal honeycomb used as a carrier for auto-exhaust catalysts. This is because auto manufacturers are most likely to employ this product. The product is superior to the metal honeycombs now in wide use in terms of improving the fuel efficiency and capacity of a car engine and scaling down the size of catalyst carriers. The metal honeycomb is produced from a 50-micron ferrite-based stainless foil (thickness: 50 microns), to (3%) were added and on which, furthermore, a micron-thick aluminum layer wa formed in advance: the aluminum con tent concerned thus amounts to 8-10%

As the aluminum content rises, th thickness of a crystallized aluminun layer increases in a sintering process fo catalyst carrier. As a result, it is possi ble to efficiently add platinum and othe catalysts to the catalyst carriers. Since it is difficult to roll stainless foil having a high aluminum content, the company plated the foil with aluminum to raise the aluminum content concerned.

Kawasaki Steel and Nippon Steel have already suppied Nissan Motor and Toyota Motor, respectively with metal honeycombs produced from 50 micron-thick nonplated ferrite-based stainless foil, to which chromium (20%) and aluminum (5%) have been added. They produce the foils by themselves but commission other firms with manufacture of the honeycombs thereform. Nippon Yakin intends to produce the said stainless foil and transform it into the catalyst carrier by itself.

PRODUCTION EXPANSION FOR METAL TAPE PLANNED IN SUCCESSION

Japanese magnetic-tape producers are heading for stepping up production of metal tape, 8mm video tape in particular. They are TDK, Hitachi Maxell, Sony and Fuji Photo Film.

Production of 8mm video tape is growing at an exceptionally high rate among video-tape products which have reached the stage of steady growth.

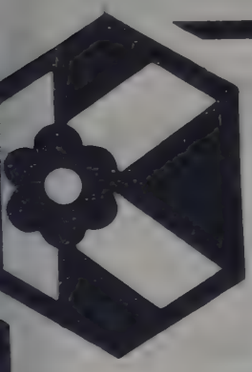
The size of the Japanese market for 8mm video tape is projected to exceed two million rolls a month and a similar amount of the product is exported.

Demand for the product is markedly increasing along with rapid spread of use of VTR-incorporated video cameras

ny — Japan's largest producer of video tape — is to raise production capacity from three to four million a month from this fall through the -end. TDK and Hitachi Maxell plan ıp capacity to 1.5 million rolls a ıth in each case. Fuji Photo Film s to scale up domestic sales of the duct to 400-500,000 rolls a month export the product in earnest. High d-type 8mm video tape is being reasingly employed and vacuum-osition tape categorized as such a oduct is recognized as being the xt-generation tape. The latter is eply thrusting into the market on the engths of reduction of production cost. oducers of metal tape have placed gh hopes on start-up of full-scale mmericialization of DAT-use tape ated for this fall. DAT will provide a rge market for metal tape if it gains ide acceptance among consumers. letal tape is also being increasingly mployed in the form of video tape for roadcasting stations and external memories for computers.

FLEXIBLE CARRIER DEVELOPED FOR EFFICIENT ANIMAL-CELL CULTURE

Kirin Brewery Co., Japan's top beer brewer, has developed together with Fukui-based Sakai Engineering Co., a new-type carrier for animal-cell culture media enabling cultivation in far higher concentration, and will market it next spring. The carrier trademarked "Cellsnow" is made of specially processed cellulose sponge having a much larger surface area than those of conventional microcarriers. Cellsnow is available in three types — electrically charged Cellsnow-EX, colagenmodified Cellsnow-CX and adhesive peptide-modified Cellsnow-PX. Using any of them, it is possible to cultivate all types of animal-cell strains in very high concentration. The Cellsnow series will be manufactured by Sakai Engineering and marketed by Kirin. It is said that at present two hundred and several tens of drugs, hormones and vaccines are under development in the world by means mass cultivation of animal cells. For such animal-culture, spherical microcarriers — 100-200 microns in diameter — have so far been used but this method has a problem with regard to production efficiency. Cellsnow is claimed to have the following advantages: (1) animal cells grow inside the foamed flexible carrier. The possible collision of carriers due to stirring and aeration will not damage the cells because the sponge carrier is very flexible; (2) the carrier has a 3-dimensional structure, so its surface area is as large as more than 10 times that of conventional microcarriers; (3) the material hydrophilic cellulose is safe and the foamed cellulose sponge allows sufficient oxygen and nutrients to pass to the cells inside the sponge; (4) the carrier can also be applied to a jar fermenter, which has been used for fermentation via microorganisms, for animal-cell cultivation in high concentration.



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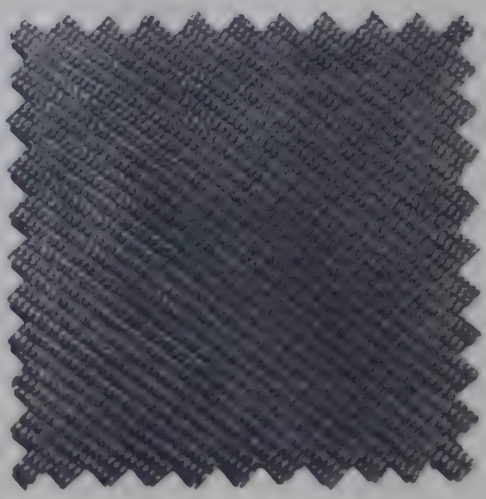

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MARKET INFORMATION

nports Ease Dye Intermediates Price

With arrivals of imported materi-, prices of most dye intermediates ve eased. Cyanuric chloride which oted at Rs. 166 per kg was down Rs. 155 per kg in the week under view. Shortage of naphthenic acid w prices of sodium naphthionate firm up by Rs. 5 per kg to Rs. 65 per kg. H-Acid firmed up to Rs. 135 per kg on brisk offtake. But on the whole, downward sentiments prevailed in the markets. On the chemicals front prices remained around previous week's levels.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on November 24, 1990)

INDUSTRIAL CHEMICALS	Per Kg.
mmonium sulphate	2.50
mmonium phosphate (Mono)	16.00
mmonium phosphate (Di)	16.00
mmonium carbonate (Di)	17.00
mmonium bicarbonate	6.00
mmonium chloride	4.00
mmonium nitrate	6.50
rsenic white powder	22+ST
crylamide (Resale)	82.00
arium carbonate	18.00
leaching powder (33% Cl)	5.00
Borax (Granular)	17.00
Borax (Powder)	24.00
Boric acid (Tech)	45.00
Bisphenol-A	75.00
Butyl carbitol	106.00
Caustic soda (Flakes)	12.60
Caustic soda (Solid)	12.00
Caustic soda (Lye)	11.50
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	62.00
Camphor (Indian)	107.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
Citric acid (Indian) (Resale)	44.00
Copper sulphate	25.00
Chromic acid	70.00
Ethylene urea	65.00
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Hexamine (Resale)	37.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone	34.00
Magnesium chloride (Crystal)	2.75
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	10,800.00
Nickel chloride	110.00
Oxalic acid (Resale)	14.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	28.00
Potassium carbonate (Imported)	32.00
Potassium bichromate	42.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	93.00
Polyvinyl alcohol (No. 173)	150.00
Polyvinyl alcohol (No. 208)	170.00
Paraformaldehyde (Resale)	22.50
Phthalic anhydride (Resale)	48.00
Pentaerythritol (Resale)	52.00
Paraffin wax	25+ST
Rangolite (German)	96+ST
Rangolite (Czech.)	80.00
Rangolite (China)	75.00
Sodium sulphate (Fine)	3.75
Sodium sulphate (Coarse)	3.50
Sodium sulphide 50-52% (Flakes)	11.50+ST
Sodium sulphide 58-60% (Flakes) (TCL)	25.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	1,300.00
Sodium chlorite 80% (Spain)	100+ST
Soda Ash (Tata)	5.50
Soda Ash (Birla)	5.50
Soda Ash (Imp.)	5.50
Sodium bicarbonate	7.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	450.00
Titanium Dioxide (Anatase)	60.00
Titanium Dioxide (Rutile – RCR_2)	95+ST
Tartaric acid	220.00
Trisodium phosphate	12.00
Thiourea	75.00
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide	58.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	16.50
Acetic Anhydride (Resale)	37.00
Acetone (Resale)	25.00
Adipic Acid	90.00
Aceto Acetanilide	72.00
Aniline Oil (HOC)	44.00
Benzoate Plasticiser	62.00
Butyl Acrylate	85.00
Butyl stearate	38.00
Butanol	34.00
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	22.00
Bromine Liquid	68.00
Chloroform	30.00
Carbon Tetrachloride	20.00
Cellosolve	65.00
Cyclohexanone	64.00
Cyclohexanol	58+ST
Diacetone (Resale)	26.75
Diethyl Oxalate	34.00
Diethyl glycol (DEG) (Resale)	38.00
Dioctyl Phthalate	60.00
Diallyl Phthalate	44.00
Dimethyl Phthalate	48.00
Dioctyl Adipate	58.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	30.00
Dimethylamine 50%	35.00
Ethyl Acetate	22.50
Ethyl Acrylate	70.00
Ethylene Dichloride	18.00
Ethylene Glycol	38.00
Formic Acid (Imp.)	24.00
Formaldehyde (Resale)	7.25
Glycerine (CP)	48.00
Glycerine (IW)	55.00
Hydrogen Peroxide 50% (Resale)	34.00
Isopropyl Alcohol	38.00
Isobutyl Alcohol (Resale)	35.00
Monoethanolamine (Resale)	105.00
Melamine	60.00
Methyl Ethyl Ketone	58.00
Methyl Isobutyl Ketone	42.00
Methyl Acrylate	72.00
Methylene Dichloride (Resale)	21.00

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Di Butyl Phthalate (D.B.P.)
Di Butyl Maleate (D.B.M.)
Di Octyl Maleate (D.O.M.)
Di Octyl Adipate (D.O.A.)
Butyl Stearate

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PHEROMONES
CARDIAC GLYCOSIDES
ANTI CANCER DRUGS
LITHOPONE, RANGOLITE
CAPROLACTAM
POTASSIUM & SODIUM HYDROXIDE
OXALIC ACID
ESSENTIALS OILS AND
AROMATIC PRODUCTS
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Alpha Picoline
Butyl Cellosolve * B.H.T.
Chloroform * Cyclohexane
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DI Methyl Sulphoxide
Epichloro Hydrine
Ethylene Dichloride
Formic Acid -- 99% & 85%
Hydroxylamine Hydrochloride
Hydroxylamine Sulphate
Iso Amyl Alcohol
Iso Butyl Alcohol
Iso Butyric Acid
Iso Propyl Alcohol
Lithium Hydroxide
Magnesium Oxide
Malonic Acid
Methyl Cellulose 4000
Methyl Cellosolve
Methyl Formate
Morpholine
Methyl Ethyl Ketone
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N. Heptane * N. Propyl Amine
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Perchloro Ethylene
Petroleum Ether 40-60%, 60-80%, 60-95%
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Xanthone * Zinc dust

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Phone: 321020/335736/344937 Residence: 6124644/6122149

Carbitol	75.00 + ST
Meta Cresol	45.00
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Octanol	52.00
Ortho Cresol	30+ST
Phenol (Resale)	44.00
Propylene Glycol	54.00
Polyethylene Glycol (No.200)	75.00
Polyethylene Glycol (No.400)	75.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	95.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	120.00
Styrene Monomer	50.00
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	26.00
Triethanolamine (Resale)	95.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	55.00

SOLVENTS	Per Litre
Benzene	14.50
N-Heptane	10.50
N-Hexane	11.00
Methanol	9.25
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	16.00
Xylene	31.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)	
Alphanaphthylamine	65.00
Alpha Naphthol (Imp.)	170.00
Aceto Acetic Ester (Methyl)	90.00
Ammonium Molybdate	225.00
Anthraquinone	155.00
Anthranilic Acid	100.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	330.00
Beta Naphthol (Atul)	60.00
Benzidine Dihydrochloride (BDH)	88.00
Bromamine Acid	550.00
BON Acid (Incl. of excise)	150.00
Chicago Acid (Atul)	340.00
Coach Acid	58.00
C. Acid (Imp.)	195.00
Cyanuric Chloride	155.00
2,4- DNCB	33.00
Dihydrothio PTOS (Imp.)	1,600.00
Dimethyl Aniline	64.00
Diethyl Aniline	125.00
Diamino stilbene disulphonic acid	165.00
3,3-DCB (Imp.)	215.00
Gamma Acid (Atul)	165.00
Gamma Acid (Local)	145.00
H. Acid (Atul)	135.00
G. Salt	60.00
J. Acid	330.00
J. Acid Urea	450.00
K. Acid	105.00
MPDS (German)	190.00
MNA	120.00

Meta Ureido Aniline	175.0
MPD (Local)	165.0
MPD (Japan)	180.0
Naphthenic Acid	46.0
N-Methyl J. Acid	510.0
N-Methyl Aniline	120.0
Naphthalene (Refined)	24.0
Ortho Anisidine (OA) (Imp.)	120.0
Ortho Dichloro Benzene (ODCB)	18.0
OT Base	140.0
Para Dichloro Benzene (PDCB)	29.0
Para Anisidine (PA local)	145.0
PNA	105.0
Para Cresidine (Imp.)	325.0
Para Amino Azo Benzene (India)	135.0
PNCB (HOC)	57.0
Para Amino Acetanilide	195.0
1-Phenyl 3-Methyl 5-Pyrazolone	142.0
Phenyl J. Acid	360.0
Para Amino Benzoic Acid	125.0
PT Base	135.0
Rhoduline Acid	550.0
Resist Salt 80%	30.0
Resorcinol	285.0
Sodium Naphthionate	67.0
5-Sulpho-Anthranilic Acid	100.0
Sulphanilic Acid	33.0
Sulpho Tobias Acid	140.0
Trichloro Benzene (TCB)	28.0
Tobias Acid (Imp.)	128.0
Metanilic Acid	42.0
MTD (German)	130.0

We Manufacture Chemicals For Industrial Use

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- Acetaldehide
- Industrial Alcohol
- Monochloro Acetic Acid
- Ethyl Acetate
- Butyl Acetate
- E D T A
- N T A
- Carboxy Methyl Cellulose

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Also Please Contact:

Baroda : Phones : 324519-325769
Telex : 0175-597 AOIL IN
Ahmedabad : Phone : 78009
Ankleshwar : Phone : 2461-2462
Telex : 0189-238 AOIL IN

New Delhi : Phones : 5710733-5711057
Calcutta : Phones : 282474-282475
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* Hydrochloric Acid
* Spent Sulphuric Acid

Please Contact:

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Manufacturers Representatives

Industrial Chemical & Acids

432, Arun Chambers, Tardeo, Bombay 400 034.

Phones: 4938395/4949655/4949656 Cable: "VANIJYA", Bombay 400 018

Telex No.: 011-71682 CHEM IN Fax No.: 4937089

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ISOSORBIDE DINITRATE 40%
ISOSORBIDE DINITRATE 25%
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DIAZEPAM
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ETOPHYLLINE
CAFFEINE (ANHYDROUS)
ATENOLOL / DILTIAZEM
DICYCLOMINE HCL
CHLORDIAZEPOXIDE BASE/HCL
DICLOFENAC SODIUM
CHLORAMPHENICOL
PEG-400 / PEG-4000
TWEEN-80

Contact:

PHARMA TRADECHEM

543, Kalbadevi Road, Ravindra House, 1st Floor, Bombay 400 002.

Phone: Off: 311924 * Resi: 290486 * Gram: HEMSONART

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Contact Manufacturers:

LEUCHTSTOFFWERK (INDIA) PVT. LTD.

Phone: 224128 Post Box No. 2003, BOMBAY - 400 002. Gram: "GLOWORM"

Bombay Drugs Market

(Prices as on November 24, 1990)

Product	Rs./kg.	Product	Rs./kg.	Product	Rs./kg
Acriflavine DPC	850.00	Disodium Hydrogen Citrate	43.00	Niacin	220 0
Aluminium Hydroxide IP	45.00	Ephedrine HCL	1850.00	Niacinamide	250 0
Ampicillin Trihydrate	1800.00	Erythromycin Estolate	2350.00	Nifedipine	1100 0
Aminophylline	360.00	Erythromycin Stearate	2150.00	Nitrofurazole	280 0
Albendazole	2100.00	Ethambutol IP	875.00	Oxyphenbutazone	775.0
Analgin	280.00	Ethophylline	650.00	Papaverine HCl	2000.0
Aspirin IP	90.00	Ferrous Fumarate	41.00	Paracetamol	180.0
Atenolol	2900.00	Folic Acid IP	2800.00	Pectin IP	425 0
Benzoic Acid IP	34.00	Furosemide IP	2200.00	Pepsin 1:3000	375.0
Bromine	67.00	Furazolidone IP	385.00	Phenbarbitone	510.0
Bromhexine HCL	2400	Guanidine Nitrate	40.00	Pheniramine Maleate	1250.0
Butylated Hydroxy Toluene	650.00	Gallic Acid	320.00	Phenyl Butazone USP	550 0
Caffeine Citrate IP	390.00	Haloperidone	19,000.00	Piperazine Citrate	100 0
Caffeine IP	410.00	Hematropine Methyl Bromide	12.00	Piperazine Hexahydrate	95.0
Calcium Gluconate IP	45.00	Hydrazine Hydrate	92.00	Potato Starch	65 0
Calcium Glycerophosphate	160.00	Ibuprofen IP	365.00	Propanolol HCL	1100 0
Calcium Lactate	40.00	Indomethazine	850.00	Pseudoephedrine HCL	2200 0
Calcium Phenthonate	700.00	I.N.H.	270.00	Pyrazinamide	1200 0
Cetrimide IP	210.00	Inosite IP	900.00	Ranitidine	2800 0
Chloramphenicol Powder	1900.00	Iodochloro Hydroxyquinoline	525.00	Rifampicin IP	3900 0
Chlorbutol	95.00	Lactose IP	40.00	Saccharine Sodium	215.0
Chlorhexidine Gluconate 20% BP	225.00	Lactic Acid	90 00	Salbutamol Sulphate	7300 0
Chloroquin Phosphate	850.00	Levamisole	1525.00	Sodium Iodide	425 0
Chlorpromazine HCL	1500.00	Lignocaine HCl	350.00	Sodium Methoxide	105 0
Choline Chloride FG	35.00	Lignocaine Base	350.00	Sorbitol Powder	115 0
Choline Chloride IP	58.00	L. Lysine Feed	95.00	Sorbitol USP	15 0
Cloxacillin Sodium	2300.00	L. Lysine Pharma	300.00	Sulphacetamide	300.0
Cimetidine	2100.00	Magnesium Hydroxide	30.00	Sulphamethoxazole	335 0
Citric Acid IP	45.00	Magnesium Trisilicate IP	12.00	Tinidazole	375 0
C.P. Maleate	1050.00	Mannitol USP	105.00	Theophylline Anhydrous	370.0
Cyproheptadine Tcl	9500.00	Mebendazole	610.00	Thiacetazone	290 0
Diazepam	800.00	Mercurochrome NF	280.00	Tolbutamide	200.0
Dicyclomine Hcl	1500.00	Methyl Chloroformate	85.00	Trimethoprim IP	1050.0
Diethyl Carbamazine Citrate	300.00	Metochlopromide TCL	2200.00	Vitamin A Palmitate	3100.0
Di-iodohydroxyquinoline	525.00	Metronidazole IP	450 00	Vitamin B6 Hydrochloride	1450.0
Diloxanide Fumarate IP	580.00	Morpholine	115.00	Vitamin B2 5-Phosphate	4100.0
Diphenhydramine HCL	260.00				

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62, Vidya Apartment, Chowpatty Band Stand, Siri Road, Bombay 400 006.

Phone: Office: 348607/323041

Residence: 8224894

Bombay Dyes Market

(Prices as on November 24, 1990)

D COLOURS	Per Kg.
d Violet 4BS	*190.00
d Maroon V	110.00
d Orange II	112.55
d Orange IIY	93.85
d Red A	137.00
d Scarlet 3R	128.35
d Red 38N	*195.00
id Red R2R	132.00
id Red RS	88.00
id Patent Blue AS	*280.00
id Green V	*375.00
id Coomasi Blue	200 00
id Yellow 5GN	65.00
id Red PG	85.00
id Red GRS	78.00
id Black 10 BX	157.15
id Black BX	126.95
id Black Wax	135.50
rosein Scarlet MOO	200.30
rocinil Yellow GS (ICI, UK)	265.00
rocinil Red GS (ICI, UK)	530.00
rocinil Blue RS (ICI, UK)	315.00
rocinil Scarlet G (ICI, UK)	600.00
rocinil Orange G (ICI, UK)	250.00
rocinil Rubine (ICI, UK)	550.00

To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320 80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128 40
Fast Scarlet RCR	105 60
Fast Scarlet G	115 75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301 85
AS	205 65
ASSW	379 10
ASBS	253 75
ASBO	266 40
ASD	209 45
ASOL	243 60

Delhi Market

DELHI: NOVEMBER 23: NNS Chatkolite registered a marked rise of Rs. 7 at Rs. 72 per kg in the Delhi chemicals market during the week under review on account of spurt in seasonal consumption alongwith restricted supply in view of scarcity of diesel oils, says NNS. Following sharp upward revision in its prices by manufacturers, sufolite shot up by Rs. 5.50 at Rs. 78. During the month its prices recorded a steep rise of Rs. 8/13 per kg. Rangolite Germany remained firm at Rs. 105. Sodium hydrosulphite Damosha and Kalali jumped up by Rs. 2 each at Rs. 51 and Rs. 52 in view of good demand from Meerut, Barot, Shamli, Muzaffar Nagar, Saharanpur and Hapur. Gulshan and Tamilnadu hydro also followed suit and edged up by Re. 1 each at Rs. 46 and Rs. 47. Caustic soda flakes quoted higher by Rs. 10 at Rs. 565 per 50 kg due to fall in supply from Gwalior Rayon and Modi mill. Ammonia bicarb spurted sharply by Rs. 25 at Rs. 190 thanks to keen buying support from bakeries. As a result of dwindling supply, mercury flared up by Rs. 100 at Rs. 10,800 per flask. Citric acid Chinese quoted higher by Rs. 50 at Rs. 2,250/50 kg because of poor supply of imported goods from Bombay.

Following poor arrivals from Sambhal, Moradabad, Rampur, Chandausi, Barabanki and Amroha areas of U.P., prices of menthol medium and bold advanced by Rs. 10 each at Rs. 305 and Rs. 320 per kg in the beginning of the week, but at the week-end on account of increased stockists offerings, prices reacted downward and finally settled at Rs. 295 and Rs. 310. After rising from Rs. 272 to Rs. 286, menthol flake receded and finally closed at Rs. 275 per kg. Mentha oil and DMO were quoted at Rs. 192 and Rs. 75 per kg.

Following slack demand from local and outside consumers, sodium nitrite suffered a fall of Rs. 100 at Rs. 950/1 100. Boric acid technical dropped by Rs. 50 at Rs. 2,250 per 50 kg in view of improved supply. Phenol slipped by Rs. 7 at Rs. 41 in the absence of enquiries. Hydrogen peroxide quoted cheaper by 50 paise per kg thanks to better supply.

Prices of dyes, colours and direct dyes did not show any variation during the week and remained unchanged at their previous level.

(DELHI MARKET RATES AS ON NOVEMBER 23, 1990)

Ammonia Bicarb (Per 25 Kg.)	190.00
Mercury (Per flask)	10,800.00
Soda ash (Per bag)	375/385.00
Ammonium Chloride (50 Kg.)	140/180.00
Caustic soda flakes (50 Kg.)	565.00
Citric acid (Per 50 Kg.)	2,200/2,450.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	101.00
Stable Bleaching Powder KCl (Per 25 Kg.)	90.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	91.00
Stable Bleaching Powder Modi (Per 25 Kg.)	92.00
Sodium Bicarbonate (50 Kg.)	325/350.00
Sodium Hydrosulphite (Per Kg.)	46/52.00
Rangolite (Per Kg.)	105.00
Tartaric acid France (Per Kg.)	314.00
Sufolite (Per Kg.)	78.00
Chatkolite (Per Kg.)	72.00
DMO (per Kg.)	78.00
Boric acid Technical (Per 50 Kg.)	2,250.00
Paraffin Wax (Per 50 Kg.)	1,200.00
Slack wax (Per metric tonne)	13,000.00
Tartaric Acid (France Per Kg.)	314.00
Tartaric Acid (Swastik Per Kg.	210.00
Borax Granular (Per 50 Kg.)	1,000.00
Borax Crystal (Per 50 Kg.)	1,000.00
Sodium Nitrite (Per 50 Kg.)	950/1,100.00
Sodium Nitrate (Per 50 Kg.)	520.00
Camphor Thal (Per Kg.)	115.00
Camphor Powder (Per Kg.)	102.00
Menthol Bold (Per Kg.)	310.00
Menthol Medium (Per Kg.)	
Menthol Flake (Per Kg.)	275.00
Mentha Oil (Per Kg.)	192.00
Glycerine (Per Kg.)	53/56.00
Sodium Silicate (Per quintal)	300/400.00
Hexamine (Per Kg.)	34.00
Acetic Acid Glacial (Per Kg.)	17.00
Copper Sulphate (Per quintal)	2,400/2,600
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	32.50/34.50
Calcium Carbonate (Per Tonne)	2,800/5,800
Acid Slurry Soft (Per Kg.)	42.00
Acid Slurry Hard (Per Kg.)	35.00
Phosphoric Acid (Per 50 Kg.)	1,400.00
Potassium Nitrate (Per quintal)	1,000/1,250.00
Potassium Permanganate (Per 50 Kg.)	2,600/3,000.00
Sodium Bichromate (Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	700.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	63.00
Titanium Dioxide RC-822 (Per Kg.)	85.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	59.00
Titanium Dioxide RCR-2 (Per Kg.)	85.00
Zinc Oxide (Per Kg.)	46.00/50.00
Phenol Carbolic Acid (Per Kg.)	41.00
Carbon Tetrachloride (Per Kg.)	24.75
Chloroform (Per Kg.)	28.00
Sodium Sulphate (Per metric tonne)	4,100/4,600.00
Naphthalene Balls (Per 50 Kg.)	1,500.00
Match Wax	21,000.00
Residue Wax	5,500.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/211.50
Naphthol ASG	180/249.70
Naphthol ASBS	210/260.75
Naphthol ASTR	300/378.92
Naphthol ASOL	210/250.90
Naphthol ASBO	195/274.30

DIRECT DYES	(Per Kg.)
Black E. Conc.	120/185.30
Diazo Black B.T.	105/154.50
Green B	90/147.55
Blue 2-B	60/107.00
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/248.20
Basic Auramine	55/110.00
Basic Rhodamine	315/425.00
Basic Methylene Blue	100/180.00
Basic Violet	165/210.00
Basic Malachite Green	185.00
Acid Orange	75/111.20

Madras Market

here has not been much change rices over the week. Though few nufacturers of soda ash have eased the prices, this had the st impact on the market prices. ustic soda continues at Rs. 575 bag and availability is good. Due cute diesel shortage, movement goods to and fro have been affected.

MMTC has announced increase in prices of sulphur and this had put up the basic price of sulphuric acid to Rs. 2,200 to Rs. 2,300 per MT. in plant and other levies. In solvent section MEK continues to be in short supply and the prices ruling at Rs. 50 plus taxes.

(MADRAS MARKET RATES AS ON NOVEMBER 24, 1990)

etic Acid Glacial (per kg)	15.50
minium Sulphate Iron free per MT)	4,000.00
monium Bicarbonate (per 25 kgs)	175.00
monium Chloride (per MT)	3,000.00
id Slurry (per kg)	36.00
rium Carbonate (per kg)	11.00
rium Chloride (per kg)	10.00
ric Acid Technical (per kg)	28.00
eaching Powder (per 50 kgs)	220.00
orax (per 50 kgs)	815.00
austic Soda Flakes -- Mettur Chemicals (per MT)	11,500.00
austic Soda Flakes -- Andhra Sugars (per MT)	11,500.00
alcium Chloride 70% Solid (per MT)	3,500.00
alcium Chloride Anhydrous (per MT)	6,500.00
alcium Carbonate (Activated) (per MT)	6,600.00
alcium Carbonate (Precipitated) (per MT)	5,600.00
itric Acid (per kg)	48.00
opper Sulphate (per kg)	25.00
resylic Acid 98-99% (per kg)	138.00
ure Para Cresol 96% (per kg)	110.00
eta Para Cresol 42% (per kg)	54.00
ormic Acid (per kg)	27.00
ormaldehyde (per kg)	8.00
lue Flakes (per kg)	15.00
lycerine I.W. (per kg)	49.00
Hydrosulphite of Soda (TCPL) (per kg)	42.00
Hydrosulphite of Soda (IDI) (per kg)	45.00
Hydrosulphite of Soda (BASF) (per kg)	48.00
Hexamine (per kg)	35.00
Hyflosupercell (per kg)	26.00
Hydrogen Peroxide (per kg)	38.00
Litharge (per kg)	38.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	16.50
Magnesium Chloride (per kg)	4.25
Maleic Anhydride (per kg)	40.00
Menthol Crystals (per kg)	370.00
Oxalic Acid (per kg)	17.00
Paraffin Wax (per kg)	24.00
Potassium Bichromate (per kg)	40.00
Phosphoric Acid (per kg)	33.00
Polyvinyl Alcohol Powder (per kg)	160.00
Pentaerythritol (per kg)	55.00
Phthalic Anhydride (per kg)	55.00
Soda Ash (TAC) (per 75 kgs)	400.00
Soda Ash (TATA) (per 75 kgs)	415.00
Sodium Bicarbonate (TATA) (per 50 kgs)	395.00
Sodium Silicate (per MT)	4,000.00
Sodium Bichromate (per kg)	33.00
Sodium Nitrate (per kg)	8.50
Sodium Nitrite (per kg)	20.00
Sodium Sulphide Flakes (per kg)	20.00
Sodium Bisulphite (per kg)	8.00
Sodium Alginate (per kg)	350.00
Sodium Acetate (per kg)	8.00
Sodium Sulphate (Anhydrous) (per kg)	4.25
Titanium Dioxide (Anatase) (per kg)	65.00
Titanium Dioxide (Rutile) (per kg)	85.00
Trisodium Phosphate (per kg)	11.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	54.00
Zinc Chloride Powder (per kg)	14.00
Zinc Sulphate (per kg)	9.00

CALCUTTA MARKET (Prices as on Nov. 25, 1990)

Acetic acid (per 50 kg)	725.00
Basic chrome sulphate (per 50 kg)	850.00
Benzene (litre)	14.00
Bleaching powder (bag)	230.00
Borax granular (per 50 kg)	NA
Boric acid (per 50 kg)	1,200.00
Camphor (per kg)	107.00
Caustic soda solid	NA
Caustic soda flakes (per 50 kg)	575.00
Glycerine (per kg)	52.50
Menthol bold (per kg)	350.00
Menthol medium (per kg)	325.00
Menthol small (per kg)	275.00
Phosphoric acid (per 50 kg)	1,400.00
Phenol (per kg)	42.00
Soda ash (75 kg)	395.00
Sodium bichromate (per 50 kg)	3,250.00
Sodium bicarbonate (per 50 kg)	375.00
Sodium nitrate (per 50 kg)	450.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.00
Trisodium phosphate (per 50 kg)	375.00
Toluene (litre)	18.00

SOLVENTS

Acetone -- HOCL (per kg)	25.00
Butanol (per kg)	38.00
Butyl Acetate (per kg)	39.00
Benzene (per lit)	17.00
Cellosolve (per kg)	70.00
Carbon Tetra Chloride (per kg)	21.00
Chloroform (per kg)	29.00
Diacetone Alcohol (per kg)	34.00
Diethylene Glycol (per kg)	40.00
Dichloroethane (per kg)	20.00
Di-octyl Phthalate (per kg)	65.00
Di-N-butyl Phthalate (per kg)	65.00
Ethyl Acetate (per kg)	25.00
Isopropyl Alcohol (per kg)	34.00
Methanol (per kg)	14.00
Methylene Chloride (per kg)	23.00
Methyl Ethyl Ketone (per kg)	50.00
Methyl Isobutyl Ketone (per kg)	46.00
Phenol (per kg)	48.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	98.00
Trichloroethylene (per kg)	27.00
1-1-1 Trichloroethane (per kg)	30.00
Turpentine (per lit)	16.00
Toluene (per lit)	18.00
Xylene (per lit)	30.00

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx sailing d (5)
7/12	Mulbera (N.S.)	Killick	S. American Ports. (Carting at Kalamboli).	9/12
6/12	Ever Bridge (V-043)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Providence (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Stockton; Richmond; Almeida; Redwood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; Various inland destinations & Caribbean Ports. (Carting at G/H Cotton Depot).	13/12
30/11	Maersk Clementine (Voy-9024)	Maersk Agency	New York; Philadelphia; Baltimore; Norfolk; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston; Toronto; Montreal; Chicago; Atlanta; Denver; Dallas; Wilmington; Milwaukee; Detroit; Minneapolis; Memphis; Nashville; Cleveland; Phoenix; Boston; Los Angeles; Vancouver; Seattle; San Francisco; Portland; Longbeach; Mexican & S. American Ports. (Carting at 19-ID).	6/12
30/11	Anika Oltmann	Samrat/ Hindustan/ L. Triest	Boston; New York; Baltimore; Norfolk; Charleston; P. Mouth; P. Lauderdale; Miami; New Orleans; Savannah; Jacksonville; P. Everglades; Philadelphia; Halifax; Montreal; Toronto & S. American Ports. (Carting at M.O.D. No. 1 for Samrat & Hindustan) (Carting at M-171/173 C.D. for L. Triest).	6/12
4/12	Hoegh Dene	Patvolk	Montreal & Toronto via Halifax; New York; Boston; Norfolk; Charleston; Houston; Savannah; Wilmington; Philadelphia; Baltimore; New Orleans; & FCL Chicago; Milwaukee; Atlanta; Dallas. (Carting at H.B. No. 5).	8/12
11/12	Rhine Forest (V-118) (Lib)	M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	12/12
14/12	Vishva Parijat (Ind)	S.C.I.	New York; Baltimore; Savannah; Norfolk; Charleston; Houston; Jacksonville; New Orleans; Boston; P. Everglades.	18/12
5/12	Oyster Bay (Voy-4055)	Arebee	Lagos/Apapa; P. Harcourt; Abidjan; Tema; Takoradi; Lome; Freetown; Cotonou; Douala; Matadi. (Carting at M-Jetha Cotton Depot).	8/12
3/12	Vermilion Bay	U.L.A./ Trident	Lagos/Apapa; Abidjan; Lome/Matadi. (Carting at M-171/173 C.D.). Tema/Lome; Lagos; Matadi; Lobito;Luanda; Freetown; Cotonou; Douala; P. Harcourt; Abidjan; Monrovia; Dakar. (Carting at T.P. No. 4).	9/12
30/11	Maersk Clementine	Maersk Agency	Lagos/Apapa; Dakar; Freetown; Monrovia; Lome; Cotonou; Douala; Tema. (Carting at 19-ID).	6/12
30/11	Anika Oltmann	L. Triest	With T.P. Lagos/Apapa; Abidjan; Dakar; Douala; Cotonou; Nouakchott; Libreville; Matadi; Conakry; Freetown. (Carting at M-171/173 C.D.).	6/12
6/12	Ever Bridge (V-043) (Pan)	Greenways	Hamburg; Felixstowe; Rotterdam; Antwerp; Le Havre; London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leeds; Leicester; Amsterdam; Bremen; Copenhagen; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast & All destinations in U.K.; Germany; Switzerland & Austria. (Carting at G/H Cotton Depot).	13/12
14/12	Vishva Parijat (Ind)	S.C.I.	(P. Said); Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Helsinki; Copenhagen; Gothenburg & All Inland destinations.	18/12
5/12	Oyster Bay	P&O	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 1).	8/12
4/12	Lanka Abhaya (Fin)	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Glasgow; Wembly; Leicester; Immingham; Birmingham; Leeds; Antwerp; Bremen; Copenhagen; Gothenburg; Hamburg; Rotterdam; Oslo; Stockholm; Helsinki; Aarhus; Malmao; Norkopping. (Carting at M.O.D. No. 3).	8/12
30/11	Maersk Clementine	Maersk Agency	Leghorn; Marseilles; Naples; Barcelona; Bilbao; Bordeaux; Alicante; Genoa; Valencia; Bremen; Jeddah; Antwerp; Rotterdam; Bremerhaven; Hamburg; U.K. & Scandinavian Ports. (Carting at 19-ID).	6/12
30/11	Anika Oltmann (Ger)	Samrat/ Hindustan/	Felixstowe; Hamburg; Rotterdam; Also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham;	6/12

(2)	(3)	(4)	(5)
		Le Havre; Bremen; Amsterdam; Antwrp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Helsinki; Stockholm; Belfast & All destinations in U.K.; Benelux; Germany; France; Switzerland and Austria; Barcelona; Marseilles; La Spezia; Livorno; (Leghorn); Genoa; and other Italian Ports and FCL only Beirut; Alexandria; Valetta; Limmassol; Larnaca; Lattakia; Mersin; Izmir. (Carting at M.O.D. No. 1 for Samrat & Hindustan)	
	Killick/	Felixstowe; Rotterdam; Hamburg; Antwerp; Le Havre; Lisbon; Leixoes; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Belfast; Bremen; Bremerhaven; Aarhus; Copenhagen; Gothenburg; Helsinborg; Oslo; Helsinki; Alexandria; Lattakia; Mersin; Malta; Limmassol; Piraeus. (Carting at E-Shed Grain Depot).	
	L. Triest	Felixstowe & U.K. Inland destinations; Hamburg; Rotterdam; & Inland destinations in Cont; Genoa; Leghorn; La Spezia; Naples; with T.P. Las Palmas; Santacruz de Teneriffe; Malta; Limmassol; Alexandria; Tunis; Benghazi. (Carting at M-171/173 Cotton Depot).	
12 Rhine Forest	M.S.P.L.	Assab. (Carting at P/Q-PD).	12/12
2 Ever Bridge	Greenways	Colombo. (Carting at G/H Cotton Depot).	13/12
2 Oyster Bay	P&O	Colombo; Chittagong. (Carting at T.P. No. 1).	8/12
2 Vermilion Bay	Silvership/ U.L.A.	Chittagong. (Carting at Timber Pond No. 3). Karachi (Afghanistan). (Carting at M-171/173 Cotton Depot).	9/12
2 Lanka Abhaya	Seahorse	Colombo. (Carting at M.O.D. No. 3).	8/12
2 Mulbera (N.S.)	P&O/I.M.E./ Killick	Singapore. (Carting at Kalamboli for all).	9/12
2 Ever Bridge (V-043) (Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at G/H Cotton Depot).	13/12
11 Maersk Clementine	Maersk Agency	Penang; Singapore; Hongkong; Keelung; Kaohsiung; Busan; Main Japan Ports; Manila; Jakarta; Surabaya; Bangkok; P. Kelang; Chinese Ports. (Carting at 19-ID).	6/12
2 Vermilion Bay (Voy-19)	U.L.A./	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan & Chinese Ports. (Carting at M-171/173 C.D.).	9/12
	Samrat/	Singapore (Direct): Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manila; Hongkong; Kaohsiung; Keelung; Taichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo. (Carting at Mallet Bunder).	
	Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at T.P. No. 4).	
	E.S.P.L.	Singapore; Hongkong; Bangkok; Jakarta; Kaohsiung; Keelung; Penang; P. Kelang; Kota; Kinabulu; Kulaubetali; Bintulu; Kuching; Labuan; Vietnam. (Carting at M-172 Cotton Depot).	
	I.M.E.	Singapore; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at Wadi Bunder No. 3).	
	P&O/	Far East & S.E. Asian Ports. (Carting at Timber Pond No. 3).	
	Sarada/	Bangkok; Hongong; Chinese Ports. (Carting at M-172 Cotton Depot).	
	Silvership	Far East; Haiphong; Ho Chi Minh. (Carting at T.P. No. 3).	
12 Lanka Abhaya	Seahorse	Singapore; Penang; P. Kelang; Bangkok; Hongkong; Keelung; Kobe; Yokohama & FCL only Busan; Inchnu; Osaka; Tokyo; Nagoya; Kaohsiung. (Carting at M.O.D. No. 3).	8/12
9/11 S/o. Nagaland	S.C.I.	Main Japan Ports; Busan (Taiwan).	10/12
1/12 Rhine Forest	M.S.P.L.	Singapore; P. Kelang. (Carting at P/Q-PD).	12/12
12 Mulbera (Nhava Sheva)	Killick/ P&O/	Melbourne; Sydney; Brisbane; Adelaide; Fremantle; P. Hobart; Devon P. Launcheston; Burnie; New Plymouth; Auckland; Wellington; Lyttelton; P. Chalmers; Christchurch; Dunedin; Napier; Also Western Samoa; Papua; New Guinea; Soloman Island; American Samoa; Tonga; New Calidonia; P. Villa. (Carting at Kalamboli for both).	9/12
	I.M.E.	Sydney; Melbourne; Adelaide; Fremantle; Brisbane; Auckland; Wellington; Lyttelton. (Carting at Kalamboli).	
12 Vermilion Bay	Samrat/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie. (Carting at Mallet Bunder).	9/12
	Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttelton. (Carting at T.P. No. 4).	
	Arabee/	Sydney; Melbourne; Adelaide; Brisbane. (Carting at M-Jetha C.D.).	

(1)	(2)	(3)	(4)	(5)
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at CFS Cotton Avenue).	
		E.S.P.L./ Silvership	Sydney; Melbourne; Adelaide; Fremantle. (Carting at M-172 Cot. Ave.). Australia & New Zealand Ports. (Carting at T.P. No. 3).	
4/12	Lanka Abhaya	Seahorse	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting at M.O.D. No. 3).	8/12
30/11	Maersk Clementine	Maersk Agency	Dubai; Dammam; Muscat; Bahrain; Riyadh; Doha. (Carting at 19-ID).	6/12
3/12	Rossana (Ind)	Mackintosh	Muscat; Dubai.	10/12
12/12	Kapitan	Sai Ship Medvetskiy	Mombasa; Dar Es Salaam. (Carting at E-Shed Grain Depot).	16/12
5/12	Oyster Bay (Voy-4055) (Brit)	Arebee/	Dar Es Salaam & Mombasa (Direct); Kampala; Jinja; Torroro; Lugazi; Entebee (Uganda); Kigali (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Zanzibar. (Carting at M.J. Cotton Depot).	8/12
		P&O	Mombasa; Dar Es Salaam (Direct); Beira; Mahe & Inland destinations in East Africa. (Carting at Timber Pond No. 1).	
3/12	Vermilion Bay	Seahorse	Port Louis. (Carting at M.O.D. No. 3).	9/12

VESSELS DUE FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
4/12	Hoegh Dene	Patvolk	U.S.A.
7/12	Jala Govind	S.C.I.	Japan/Far East
7/12	Mulbera (Nhava Sheva)	P&O/Killick/I.M.E.	Australia/New Zealand & Gulf
5/12	Oyster Bay	P&O	E. Africa
5/12	Orange	Marcons	Turkey
11/12	Rhine Forest	M.S.P.L.	U.S.A.
7/12	S/o. Tripura	S.C.I.	U.K. Cont.
9/12	Trade Master	Maltrans	Cont.
14/12	Vishva Parijat	S.C.I.	U.K. Cont/U.S.
4/12	Vishva Karuna	S.C.I.	Med. Ports.
11/12	Vishva Nayak	S.C.I.	Illyichevsk & Bandirma

Available From Ready Stocks

BARIUM : CHLORIDE / CARBONATE / SULPHATE
MANGANESE : CHLORIDE / ACETATE / SULPHATE
STRONTIUM : CHLORIDE / CARBONATE / SULPHATE
MAGNESIUM : CHLORIDE / CARBONATE / SULPHATE
CALCIUM : CHLORIDE — Fused/Anhydrous

Contact:

TRICO CHEMICALS

1, 'SANGAM', 19th Road, Chembur, Bombay - 400 071
Tel. No. 5558265, 5557732, 4112934 Grams: TRICOGOLD
DELHI : R.K. GUPTAJI - 8920745

Materials Imported/Exported

Import values are c.i.f. port; Export values are f.o.b. port

MATERIALS IMPORTED MADRAS (From 27/7/90 To 15/7/90) Continued from previous issue)

TITANIUM DIOXIDE: From Singa-re: Addision Paints and Chemicals d., 34 Mts., Rs. 14,82,898.

TOLUENE DIISOCYANATE: From SA: Memorafoam, 19 Mts., Rs. 29,469.

TRIMETHOXY BENZALDE-YDE: From Japan: Aditya Organics td., 2,010 Kgs., Rs. 8,37,273.

3, 4, 5 TRIMETHOXY BENZAL-EHYDE: From Netherlands: Inventaa hemicals P. Ltd., 9,450 Kgs., s. 41,02,212.

VANILLIN: From France: The Mysore Agarbathi Mfg. Co-op., 1,500 Kgs., Rs. 4,03,120.

PLASTICS MATERIALS IMPORTED MADRAS (From 2/7/90 To 15/7/90)

HDPE: From FRG: Madura Coats Ltd., 25 Kgs., Rs. 980; From Japan: Quality Filaments, 20 Mts., Rs. 3,32,760; SPIC, 50 Mts., Rs. 8,20,907; From Korea: Krishna Polypacks P. Ltd., 16 Mts., Rs. 2,55,657; From Singapore: Amman Polysacks P. Ltd., 136 Mts., Rs. 16,67,198; From Singapore: Asian Bags P. Ltd., 116.375 Rs. 10,44,950; Hoysala Blow Moulders India Ltd., 17 Mts., Rs. 2,60,965; Intl. Impex, 62 Mts., Rs. 8,93,508; From USA: Satya Exports, 17,150 Kgs., Rs. 2,75,340; From USA: Intl. Plastics, 35 Mts., Rs. 4,01,902; Sudarshan Polymers, 45 Kgs., Rs. 44,576.

LDPE: From Japan: STC, 96 Mts., Rs. 15,85,344.

POLYETHYLENE: From Japan: Ashok Polytex, 15 Mts., Rs. 2,40,240; From Korea: Jass Inds., 10 Mts., Rs. 1,49,700.

POLYPROPYLENE: From Italy: Simco Engg. Ltd., 30 Mts., Rs. 4,46,120; From Japan: Chokkar Polybags, 16,000 Kgs., Rs. 2,55,264; Electronic Research Ltd., 27 Mts., Rs. 23,47,139; From Singapore: Eskay Enterprises, 16 Mts., Rs. 2,36,670; Lakshmi Polypack, 32 Mts., Rs. 4,81,000; From USA: Associated Mica Exports, 16.50 Mts., Rs. 2,47,550; Lakshmi Polypack, 50 Mts., Rs. 7,03,060; M.M. Rubber Co. Ltd., 90 Mts., Rs. 13,22,472; TVS Whirlpool Ltd., 5,164 Kgs., Rs. 1,38,245.

POLYSTYRENE: From Korea: Beardsell Ltd., 34 Mts., Rs. 8,36,313; Deccan Plastics, 34 Mts., Rs. 6,25,842.

DRUG MATERIALS IMPORTED MADRAS (From 2/7/90 To 15/7/90)

AMPICILLIN SODIUM STERILE: From Spain: TTK Pharma Ltd., 200 Kgs., Rs. 2,76,511.

BARBITURIC ACID: From FRG: Babros Chemicals P. Ltd., 800 Kgs., Rs. 1,31,008.

CHLORAMPHENICOL SODIUM: From Spain: Mutha Meena Agencies, 50 Kgs., Rs. 65,756.

DILTIAZEM HCL: From Italy: TTK Pharma Ltd., 25 Kgs., Rs. 1,10,041.

DOMPERIDONE: From Cyprus: Medispan Ltd., 5 Kgs., Rs. 59,285.

ERYTHOMYCIN OXALATE: From USA: Pradeep Drug Co., 25 Kgs., Rs. 47,536.

FURALIDONE HCL: From Netherlands: Eskayef Ltd., 2,000 Kgs., Rs. 5,13,409.

GRISEOFULVIN: From Hongkong: American Remedies P. Ltd., 260 Kgs., Rs. 1,90,116.

HYDROXYLAMINE SULPHATE: From Japan: Godawari Drugs P. Ltd., 17.5 Mts., Rs. 4,10,397.

SULPHADIAZINE: From China: Malladi Drugs & Pharml., 1,000 Kgs., Rs. 2,18,390.

MATERIALS IMPORTED MADRAS (From 16/7/90 To 30/7/90)

ACETYL CHLORIDE: From FRG: Priya Chemicals, 14,440 Kgs., Rs. 3,80,908; Shasun Drugs, 14,440 Kgs., Rs. 4,09,028; From Netherlands: Shasun Drugs, 14,060 Kgs., Rs. 4,01,998.

N-ACETYL SULPHANILYL CHLORIDE: From Japan: Standard Organics Ltd., 40 Mts., Rs. 17,16,019.

ACRYLAMIDE: From Japan: Tushar Enterprises, 30,000 Kgs., Rs. 6,78,002.

AROMATIC CHEMICALS: From FRG: Bush Boake Allen Ltd., 255 kgs., Rs. 48,640; From Switzerland: The Mysore Agarbathies Mfg., 350 Kgs., Rs. 92,309.

BARBITURIC ACID: From FRG: Babros Chemicals Pvt. Ltd., 800 Kgs., Rs. 1,31,007.

BARIUM CHLORIDE: From Singapore: Chemfab Alkalies Ltd., 20.5 Mts., Rs. 1,35,287.

BENZALDEHYDE: From Netherlands: Malladi Drugs & Pharml. Ltd., 31.200 Kgs., Rs. 8,76,958.

BENZOTHIAZOLE: From USA: Cheminor Drugs Ltd., 500 Kgs., Rs. 63,291.

BIO CHEMICALS: From Sweden: Madurai Kamaraj University, 33 Kgs., Rs.2,907; From USA: Madurai Kamaraj University, 41 lbs. Rs. 47,861.

TERTIARY BUTYLAMINE: From Japan: Neuland Laboratories Ltd., 6,000 Kgs., Rs. 3,42,364.

PARA TERTIARY BUTYL CYCLO HEXA ACETATE: From UK: Aravinda Parimala Works, 500 Kgs., Rs. 37,087.

CAPROLACTAM: From Netherlands: SRF Ltd., 252 Mts., Rs. 78,07,362.

ORTHOCHLORO BENZALDEHYDE: From Japan: Sol Pharmaceuticals Ltd., 13,300 Kgs., Rs. 9,40,020.

3 CHLORO 4 FLUORO ANILINE: From UK: Dr. Reddy's Laboratories Ltd., 1,500 Kgs., Rs. 4,99,247.

2 CHLORO PROPIONIC ACID: From Japan: Biochem Industries, 32 Mts., Rs. 6,60,642.

CHLOROFORM: From France: Neuland Laboratories Ltd., 19,800 Kgs., Rs. 2,50,620.

2, 3, 6 COLIDINE: From Japan: Dr. Reddy's Laboratories Ltd., 54 Kgs., Rs. 1,46,530.

4-CYANOPYRIDINE: From Japan: Veer Chemie and Aromatics Pvt. Ltd., 10,000 Kgs., Rs. 9,91,411.

CYCLOHEXANE: From Singapore: AVM Enterprises, 14,820 Kgs., Rs. 2,23,015; From Netherlands: The Scientific Fertiliser Co. Ltd., 33,228 Kgs., Rs. 6,35,322.

DIETHYLAMINE: From Japan: Shree Krishna Impex, 32,600 Kgs., Rs. 4,28,054.

DIMETHYL TEREPHTHALATE: From FRG: Indian Organic Chemicals Ltd., 6,22,080 Kgs., Rs. 68,28,160; ISCL, 2,49,480 Kgs., Rs. 27,38,377.

DIOXANE: From Japan: TPS Labs. Pvt. Ltd., 5 Mts., Rs. 1,26,464.

EPICHLOROHYDRIN: From Japan: SIP Resins Ltd., 15,840 Kgs., Rs. 3,68,777.

ETHISTERONE: From FRG: Tamilnadu Dadha Pharm. Ltd., 200 Kgs., Rs. 9,36,088.

ETHYLAMINE: From Japan: Shree Krishna Impex, 16,380 Kgs., Rs. 2,14,027.

ETHYL BENZENE: From Netherlands: ICI India Ltd., 13,600 Kgs., Rs. 2,21,790.

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GRISEOFULVIN: From Hong Kong: American Remedies Pvt. Ltd. 480 Kgs., Rs. 2,56,058.

GUAIACOL: From Japan: Synthokem, 5 Mts., Rs. 5,08,984.

HYDRAZINE HYDRATE: From USA: Danal Metalic Oxides, 6 Mts. Rs. 2,01,823.

HYDROGEN PEROXIDE: From China: Parag Corpn., 3,192 Nos., Rs. 6,35,742.

BETA HYDROXY ETHYL HYDRAZINE: From Netherlands: Synthokem 2 Mts., Rs. 2,58,475.

D-PARA HYDROXY PHENYL GLYCINE: From Singapore: Aurobindo Pharma P. Ltd., 1,000 Kgs., Rs. 3,89,483.

HYDROXYLAMINE SULPHATE: From FRG: Siris Ltd., 10 Mts., Rs. 4,47,720; From Japan: Standard Organics Ltd., 35 Mts., Rs. 8,22,250.

ISO BUTYL BENZENE: From UK: Harren Drugs Pvt. Ltd., 7.2 Mts., Rs. 4,21,023; From USA: Priya Chemicals, 13.657 Mts., Rs. 7,97,876; Priya Chemicals, 13.657 Mts., Rs. 7,97,879; Shasun Drugs, 13,657 Kgs., Rs. 7,97,875; From USA: Shasun Drugs, 13,657 Kgs., Rs. 7,97,875; Sumitra Pharm & Chem Ltd., 27.314 Mts., Rs. 15,71,572.

ISO EUGENOL: From Singapore: Vasu Agarbathies, 70 Kgs., Rs. 11,110.

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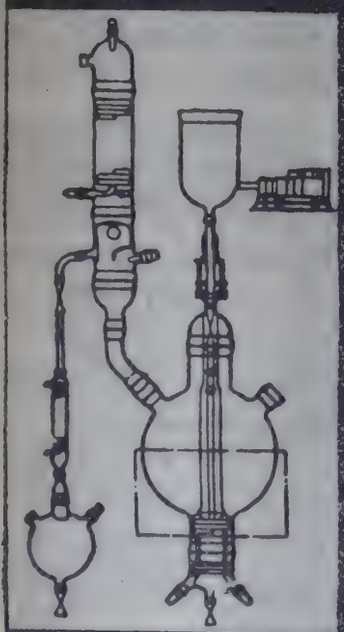

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DL-ALPHA PHENYL GLYCINE BASE: From China: Aurobindo Pharma Pvt. Ltd., 2,000 Kgs., Rs. 5,45,276.

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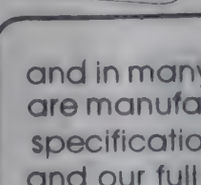

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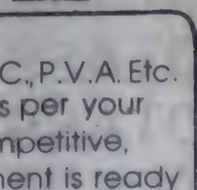

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TRIMETHOXY BENZALDE-HYDE: From France: Coastal Pharma Chemicals, 2,000 Kgs., Rs. 8,85,189; Standard Organics Ltd., 5,000 Kgs., Rs. 22,12,971; From Japan: Plant Organics Ltd., 2,010 Kgs., Rs. 8,78,227.

3,4,5 TRIMETHOXY BENZAL-DEHYDE: From Netherlands: Standard Organics Limited, 8,715 Kgs., Rs. 38,27,894.

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TRIMETHYL ORTHOFORMATE: From FRG: Encee Aromatics Ltd., 7,040 Kgs., Rs. 8,49,614.

VANILLIN: From France: The Mysore State Agarbathi Mfg. Co-op. Society Ltd., 1,350 Kgs., Rs. 3,68,061; From Japan: Kwality Biscuits Ltd., 500 Kgs., Rs. 1,23,926; From USA: Bush Boake Allen India Ltd., 1,500 Kgs., Rs. 3,85,057.

ZINC CHLORIDE: From France: Fenner India Ltd., 5,000 Kgs., Rs. 56,194.

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POLYSTYRENE: From Korea: Chemie Enterprises, 102 Mts., Rs. 14,44,628; 102 Mts., Rs. 14,44,628; Murugappa Electronics Ltd., 34,000 Kgs., Rs. 7,99,756; Suryodhaya Plastics Ltd., 17 Mts., Rs. 3,48,040.

PVC RESIN: From Netherlands: Shyam Vinyls Limited, 262 Mts., Rs. 76,19,317.

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CHLORPHENIRAMINE MALE-TE BP/USP: From China: Medo-arm, 100 Kgs., Rs. 79,136.

EPHEDRINE HCL BP 80: From nina: Medopharm 50 Kgs., s. 52,403.

ERYTHROMYCIN LACTATE: rom Italy: Pradeep Drug Co., 33.557 gs., Rs. 37,269.

FURAZOLIDONE: From Hungary: ledopharm, 500 Kgs., Rs. 73,733.

MORPHOLINE: From USA: Stand-rd Organics Ltd., 15,023 Kgs., s. 4,93,429.

PROMETHAZINE THEOLATE P: From Ireland: Tablets (India) Ltd., 0 Kgs., Rs. 1,23,289.

SULPHADIAZINE: From China: Malladi Drugs & Pharmaceuticals, ,000 Kgs., Rs. 2,13,334.

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ACETALDEHYDE: From FRG: Lux Flavours, 240 Kgs., Rs. 20,034.

2-ACETYL 3 METHYL PYRA-ZINE: From UK: Bush Boake Allen (India) Ltd., 0.5 Kgs., Rs. 15,920.

ACETYLENE BLACK: From Sin-gapore: Indo National Ltd., 4,310 Kgs., Rs. 1,31,390.

ALUMINA ACTIVATED: From Switzerland: Asian Peroxides Ltd., 1,996 Kgs., Rs. 82,465.

ALUMINA OXIDE: From Singa-pore: Nova Magnetics Ltd., 681 Kgs., Rs. 87,511.

ALUMINIUM OXIDE: From USA: Grindwell Norton Ltd., 4,989.79 Kgs., Rs. 3,37,722.

AMINO 1 BUTANOL: From FRG: Medchl Chemical & Pharm, 8,190 Kgs., Rs. 13,62,942.

AMPICILLIN TRIHYDRATE: From FRG: Tamilnadu Dadha Pharma Ltd., 850 Kgs., Rs. 8,07,844.

ANTIMONY TRIOXIDE: From China: Fenner India Ltd., 10,000 Kgs., Rs. 3,54,076.

BISPHENOL: From Japan: SIP Resins Ltd., 1,000 Kgs., Rs. 49,645.

BUTACHLOR TECH: From USA: T.N. Agro Inds. Corpn. Ltd., 34,620 Kgs., Rs. 13,60,074.

CAPROLACTAM: From Nether-lands: SRF Limited, 367 Mts., Rs. 1,13,34,968.

CARBON BLACK: From Singa-pore: Nova Magnetics Ltd., 299.64 Kgs., Rs. 64,710; From USA: Prakash Pipes & Inds. Ltd., 699.87 Kgs., Rs. 80,537.

ORTHO CHLORO BENZALDE-HYDE: From Japan: SOL Pharmaceut-icals Ltd., 1,200 Kgs., Rs. 85,456.

CHLORPROPIONIC ACID: From UK: Bio Chem Inds., 20 Mts., Rs. 4,09,354.

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2, 4 DICHLOROPHENOL: From France: ICI India Ltd., 270.6 Kgs., Rs. 26,556; Reckitt & Colman Of India Ltd., 4,896 Kgs., Rs. 1,94,919.

DIMETHYL FORMAMIDE: From FRG: Reckitt & Colman of India Ltd., 5,130 Kgs., Rs. 89,004.

DIMETHYL SULPHOXIDE: From USA: Prasad Drugs Pvt. Ltd., 9,072 Kgs., Rs. 2,45,731.

EPICHLOROHYDRIN: From Japan: Shree Krishna Impex, 15,840 Kgs., Rs. 1,95,061; SIP Resins Ltd., 47,520 Kgs., Rs. 10,90,306.

ERYTHROMYCIN THIOCYANATE: From USA: Pradeep Drug Co., 2,211 Kgs., Rs. 20,81,850.

ETHYL BENZENE: From Netherlands: ICI India Ltd., 27,200 Kgs., Rs. 4,43,502.

2 ETHYL ANTHRAQUINONE: From FRG: Asian Peroxides Ltd., 4,000 Kgs., Rs. 12,25,101.

2 ETHYL HEXANOIC ACID: From USA: SOL Pharmaceuticals Ltd., 4,820 Kgs., Rs. 98,458.

FURFURYL ALCOHOL: From Belgium: Globe Graphics Ltd., 10,720 Kgs., Rs. 5,65,01; Vivre Labs Pvt. Ltd., 2,400 Kgs., Rs. 77,542.

GLYOXYLIC ACID: From Japan: ICI India Ltd., 500 Kgs., Rs. 37,091.

GUAIACOL: From Japan: Synthokem, 5 Mts., Rs. 5,08,983.

HEDIONE: From USA: Aravinda Parimala Works, 1,000 Kgs., Rs. 3,90,335.

HYDRAZINE HYDRATE 80%: From USA: Standard Organics Ltd., 21,400 Kgs., Rs. 6,65,570.

HYDROXYLAMINE SULPHATE: From FRG: Standard Organics Ltd., 30 Mts., Rs. 12,63,216.

INDOMETHACIN:From China: T.N. Dadha Pharmaceuticals Ltd., 250 Kgs., Rs. 77,800.

IODINE CRUDE: From Japan: Eskayef Ltd., 3,000 Kgs., Rs. 8,49,701.

ISO BORNYL CYCLOHEXANOL: From Belgium: Padmini Products, 2,000 Kgs., Rs. 4,19,579.

ISOBUTANOL: From FRG: Curecraft Chemicals, 9,200 Kgs., Rs. 1,35,211.

ISOBUTYL BENZENE: From UK: Biochem Inds., 13.6 Mts., Rs. 7,68,462; Cheminor Drugs Ltd., 54,720 Kgs., Rs. 30,75,702; From USA: Shasun Drugs, 27,314 Kgs., Rs. 15,95,750.

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LAURYL CHLORIDE: From UK Peroxides India Ltd., 0.5 Kgs., Rs. 200

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2 MERCAPTO 5 METHOXY BENZIMIDAZOLE: From FRG: Dr Reddy's Labs. Ltd., 50 Kgs. Rs. 1,06,892.

DL METHIONINE: From FRG: Skin Animal Feeds & Foods Ltd., 55.000 Kgs., Rs. 10,95,262.

METHYL ACETOACETATE: From USA: Shasun Chemicals Ltd., 30.672 Mts., Rs. 7,33,064.

METHYL ETHYL KETONE: From UK: Murugappa Electronics Ltd., 30,400 Mts., Rs. 3,48,320.

N METHYL PYRROLIDONE: From FRG: SRF Ltd., 2,100 Kgs., Rs. 1,71,539.

D ALPHA PHENYL GLYCINE BASE: From China: Aurobindo Pharma Pvt. Ltd., 1,000 Kgs., Rs. 2,72,630.

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